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SEPTEMBER, 1834.

Experiments to determine the proper relative dimensions for the cylinder of a Steam Engine.

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—Having several years since made a few experiments to ascertain the best proportion for the cylinder of a steam engine, I respectfully submit the following sketch of the results. The boiler made use of was placed vertically, the fireplace being on the inside. The cylinders used were made of brass, fitted with care, and every precaution was taken to equalize the friction, the quantity of work done, and the quantity of fuel used. None of the trials were discontinued until decisive results appeared to have been obtained.

Experiment No. 1.—The cylinder used in this experiment was four and a half inches in diameter, and had a stroke of nine inches. It was governed to various velocities, until the most efficient and economical was found, which was adopted. *The same rule was followed in all cases in relation to determining the best rate of motion of the piston.* This engine worked well, doing the work of five men, and consuming one ton of coal in twelve days, but close attention to the fire was necessary to keep a sufficient supply of steam without losing time.

Experiment No. 2.—A cut off valve, so arranged as to shut off the steam at any point, and regulated by the governor was now added, and at once removed the difficulty of keeping up the steam, and ex-

tended the time required to burn a ton of coal to fourteen days. The cut off was occasionally thrown off for the purpose of verifying this and the preceding experiment.

Experiment No. 3.—Cylinder No. 2. With this cylinder the length of stroke was nine inches, the diameter of the cylinder being seven inches. This worked with great power and smoothness, but steam could not be kept up by the consumption of one ton of coal in twelve days; the quantity of work performed was reduced full twenty per cent. below experiment No. 2. All attempts to apply the cut off proved abortive, and after doubling the weight of the fly wheel without improvement, the whole machine was placed in the hands of an experienced builder, with permission to make whatever alterations he thought proper, on condition of taking the engine at cost price, should it not prove good.

In the above trials the time required to get up the steam to one hundred pounds, was about twenty-five minutes. While the engine was being rebuilt, the boiler was reset, and such alterations made as enabled us to bring the steam to one hundred pounds in twenty minutes.

Experiment No. 4.—Cylinder No. 2; rebuilt, with a fly wheel six feet in diameter, and weighing four hundred pounds. A variable cut off was applied, and regulated by the governor, but after some days spent in ineffectual attempts to make use of it, it was abandoned, and no further trials made with it on this cylinder. Owing to the increased draught, the consumption of fuel was one ton in ten days, but no advantage was gained over experiment No. 3.

Experiment No. 5.—Finding so little encouragement to continue the above form, it was determined to try the other extreme; and experiment No. 5, was performed with a cylinder two and seven-eighths inches in diameter, and of fifteen inches stroke, and using a permanent cut off at half stroke. This immediately proved its superiority, by reducing the consumption to one ton in eighteen days, the boiler having been restored to its original setting.

Experiment No. 6.—The long slide and cut off valves were now removed, and a combination of two steam valves cutting off at half stroke close to the end of the cylinder, and two escape valves, worked by the same eccentric, and all enclosed in the same steam box, was substituted. The escape valves were so arranged as to permit the steam to escape *previous* to the crank reaching the centre. This effected a further reduction in the cost of fuel, having extended the time to twenty days; but several additional machines having been added to those already in use, the time was finally reduced to sixteen days.

Valves of the form last used are well adapted for locomotive engines, being easily kept in repair, and requiring no other apparatus for moving them, than the simple eccentric and rod, and possessing the peculiar quality of letting on the steam during the whole length of the stroke when worked by hand, but cutting off at half stroke whenever the eccentric rod is thrown into gear.

J. M.

Philadelphia, July 6th, 1834.

P. S. The engine with which experiment No. 4 was tried, has lately had two inches added to the thickness of the piston, and the length of stroke reduced to seven inches. This I am told has proved injurious, but as my informant is not at present in this city, I cannot say to what extent.

M.

Some Experimental Researches to determine the nature of Capillary Attraction. *By* JOHN W. DRAPER.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

If we take a couple of leaden bullets, and pare away from each of them a small shaving, with a sharp penknife, so as to leave a bright, plane, metallic surface, on bringing them into contact, and gently pressing them together, they will be found to adhere very strongly—it requires some effort to separate them. The same takes place where two pieces of plate glass are used, and this phenomenon sometimes occurs on a large scale in manufactories of plate glass, where the pieces, after being dressed are piled on one another. The attractive force, acting constantly for a length of time, during which extensive barometric and thermometric changes occur in the atmosphere, the effect is to bring the pieces into such close contact, that they actually become united, and may be cut as one piece by a diamond.

We may likewise observe round the edge of a glass of water, that the liquid appears to stand higher wherever it touches the glass, than it does in the centre of its surface. From the former experiment, we see that solid bodies, upon an approximation almost to contact, attract each other; from the latter, that the attraction still exists even if one of the bodies be a liquid; for this rise of water, is plainly owing to the existence of an attractive force, between the water and the glass.

If we take a tube of small diameter, and dip one end of it into a cistern of water, we see the effect of this attraction in its most striking point of view. The liquid immediately rises in the tube, to a height proportionally greater as the tube is smaller. Glass tubes may be made of such excessive fineness, that their bore shall be much less than the diameter of a hair. Such tubes are called capillary tubes, and from the phenomenon taking place in them to the greatest extent, this attraction has been called capillary, or the phenomena of capillary tubes.

But, while some liquids thus rise in glass tubes, there are others in which a reverse effect takes place; mercury, or melted lead, or tin, falls. The circumstance of a rise or fall, appears to be dependant on the nature of the tube and liquid as regards each other; thus if a tube be indued with grease, water will not rise in it, but is depressed. For different tubes of different diameters, the elevation or depression of a liquid, is in the inverse ratio of their diameters.

It is not known to whom we are indebted for the discovery of these singular facts, as they were well ascertained before the time of Newton—they are doubtless the result of the labours of some early experimenter. Boyle made experiments on the adhesion of polished marbles, at first attributing it to atmospheric pressure, but afterwards finding out his error, he relinquished that idea. At that time, the explanation given by philosophers of the rise of liquids in capillary tubes, was either founded on a supposition, that the atmospheric pressure *within* the tube was less than *without*, owing to the narrowness of the bore, or that there was a subtile fluid, which, flowing from the bottom to the top of the tubes, in a silent whirlpool, carried the liquids in its vortex; both these hypotheses were rejected by Newton, on considering that, in every case, the amount of rise, ought to be in an inverse ratio of the specific gravity of the liquid. So, whilst philosophers vainly tried to find, in agents exterior and invisible, the true causes of the phenomenon, this very cause existed in the tube they held in their hands, and depended on that kind of attraction designated by the name Attraction at Small Distances. Newton, after several erroneous guesses, came to this conclusion, whilst other philosophers were yet tardy to acknowledge the truth, willing rather to attribute all the phenomena to the unknown pressure of some spiritual fluid, or the vortices of some subtile matter. This was the last refuge of the vortices of Descartes, which after being banished from the celestial regions, sought to maintain themselves in those recesses of nature, where attraction, reproduced under another form, disputed the place with them. Succeeding philosophers have seen reason to attribute the whole class of phenomena to the same cause, and only differ as regards the mechanism by which all the effects are produced. (Hauy.)

With very little exception, nothing has been effected since that time to determine by experiment, the true nature of this attraction; and, indeed, I do not see how it was possible to come at the truth, without every aid that science, as it now stands, can afford. Capillary attraction having fallen into the hands of mathematicians, several of the most distinguished paid considerable attention to it. Of all these geometers, Clairaut alone came to one conclusion of vital importance, which I shall endeavour to indicate.

It has been already noticed, that whilst water and other liquids rise in tubes of glass, mercury experiences a corresponding depression. At first sight it might appear, that if the rise of water is in consequence of an attraction between the glass and that liquid, the depression of mercury might be attributed to a true repulsion, and this receives some colour from the fact, that liquids which can *wet* solid tubes, rise in them; but if they are unable to *wet* them, they fall. Thus water will wet glass, but quicksilver will not. Clairaut found, however, that both the rise and fall of liquids, are due to attraction, as compared with the adhesion of the fluids. He found, that if the mutual attraction of a solid and fluid, amount to less than half the cohesion of the latter, there will be a depression; if it be

equal to half, the liquid will stand level in the tube, and if it surpass the half, the liquid will rise.

As other theories have disappeared before that of Clairaut, it, in its turn, disappeared before that of the Marquis Laplace, and that of Dr. Young. I do not stay now to determine whether we are to consider the bounding meniscus as elastic surfaces, acting by their tension, which was the doctrine of Dr. Young, or whether, with Laplace, we are to attribute the rise or fall of liquids, to the attraction of a thin layer of liquid, immediately adjacent to the sides of the tube. The latter, I believe, will be found most agreeable to the general tenor of my experiments.

At a particular time of the year, a phenomenon takes place throughout all the vegetable world,—this is the rise of sap,—which is immediately connected with the budding, blossoming, and flourishing, of trees, plants, and flowers. In the months of April and May, if we cut asunder a vine branch, at one blow with a sharp axe, we shall perceive that the wood is nothing more than a vast collection of capillary tubes, from the wounded extremity of each of which, there runs a limpid water. By cutting the stump shorter and shorter down towards the ground, we shall find that it proceeds thence. On the 20th of April, I cut asunder at one blow with an axe, a vine of about one inch and a half in diameter, at about eighteen inches from the ground, and placed a vessel to receive the tears, covering the arrangement with branches, to protect it from the rays of the sun. The thermometer stood at 109.2° Fahr. in the sun, and 80.7° in the shade. The barometer 29.92, and the time of the day twenty minutes before ten in the morning. In the course of eight hours, the barometer had risen .1 inch, and the thermometer having fallen to 76°, the liquid was measured, and seventy ounces were found in the vessel. More would doubtless have been collected, but the extremities of the tubes were covered with a gelatinous matter, which choaked them. This fluid had a vegetable taste. Through a powerful microscope, no animalculæ, or signs of life, could be found. There were, however, a number of semi-opaque bodies, some of a globular, and some of an ellipsoidal form, smaller in diameter than the capillary tubes. In a few days these appeared to have putrified, and then the whole liquid swarmed with life.

This phenomenon, the rise of sap in trees, from its generality and importance, has long been studied. The nearest approach to ascertaining its true nature, was made by Dutrochet, who, relying on a certain galvanic experiment, and aided by the discovery of endosmosis which he had made, to which there will be occasion hereafter to refer, attributed it entirely to the action of electrical currents. The mechanism he designed was erroneous, but he was far in advance of any of his predecessors.

This was the state in which I found capillary attraction; my attention was first drawn to it during those tiresome moments of returning health, which follow an autumnal fever. Perhaps, if there be any merit in these experiments, it may hereafter be of service to some one to know, that they were begun in sickness, and in a land of

strangers,—they were pursued in all the calamity of family bereavement, and in the depths of forests, alike unused to music, to poetry, or to philosophy. Solitude, if it be conducive to the development of the intellect, and favourable to the exercise of thought, is likewise attended with many evils. Though no disturbance arises from the intrusion of the frivolous, yet the counsel and assistance of the wise are wanting, and, indeed, those advantages which are supposed to result from such tranquillity, are, for the most part, only fictitious appearances, which, like certain other apparitions, every one can discourse of, but no one can say he has seen.

My first experiments were made in regard to the rise of liquids in tubes, but it was soon found that this was too complicated a phenomenon, to offer any chance of detecting its causes. It might depend, as Laplace showed, on the positive or negative action of the bounding meniscus. Now the adhesion of plates of glass to the surface of different liquids, was allowed to depend on the same cause as the rise of those liquids in tubes of glass, and it was void of that complexity which enveloped the phenomena of capillary tubes. I first tried to assimilate the two, but quickly found that no positive conclusion could be arrived at in this way. For instance, there was a strong and variable attraction between mercury and glass, so that the pan of a balance required a very heavy load to detach them—but, mercury experiences a depression in tubes of glass.

Clairaut's theorem, however, will be found to reconcile these cases; it directly tends to prove that the force of attraction might even amount to more than the force required to separate a disk of glass from water, provided it could be proved, that the cohesion of mercury is double, or more than double that of water. I performed, again and again, the experiment of the adhesion of a glass plane to the surface of mercury, and found it was very difficult to make the valuation of the weight required to separate them, equal in any two experiments. Changes in barometric pressure, as determined by an excellent instrument, had no equivalent influence. Variations of temperature, seemed to exert a powerful effect on the adhesion, yet it was by no means uniform. The hygrometer sometimes afforded comparable experiments, and then again it gave conflicting results. However, after making a great number of these, and similar trials, I found that mercury chemically pure, which had sustained a long boiling, and disks of glass which had been kept for some time at a temperature approaching 500° Fahr. would, in a majority of cases, give identical results. But here again, if the glass were suffered to cool, if it was touched lightly by the finger, or if a particle of lead, or tin, or bismuth, was dissolved in the metal, the results were instantly discordant.

Hitherto I had had no theory or opinion to gratify, and I resolved to be led astray by no vain or crude notion, but making experiment the means, to regard truth as the *end*. I could not suppose these variations of adhesion by any means originated in alternations of the attractive force, but was obliged to suppose that they arose from disturbing causes, which acted at one period more effectually than

at another. To get rid of hygrometric humidity, I brought some mercury to the boiling point, and kept it so for some hours. It was then filtered, with the least possible exposure to atmospheric air, to separate any impurity which it might have contracted during ebullition. It was now suffered to cool down to 212°, and a clean plate glass disk laid on it, at the same temperature. The glass was insulated by a rod of gum lac, and the mercury contained in a cup supported by pillars of the same substance, an amalgamated wire proceeded from it, to the ball of a very sensible gold leaf electrometer; as long as the mercury and plate were in contact, the leaves of the electrometer hung parallel to each other, but on separating them, and it required considerable force to do so, a vast quantity of electricity was instantly developed, and the electroscope leaves were torn asunder by the violence of the repulsion. On carrying the plate of glass to another similar electroscope, by its insulating handle, the leaves diverged, and continued striking the sides of the instrument for several times in rapid succession. On examining the electrical state of the two substances. I found the mercury to be negative, and the glass disk positive. The electric equilibrium is therefore disturbed by the separation of glass from mercury. Whilst they are in contact there is indeed no development capable of being recognised by the electroscope, their electricity is at that moment disguised, and from theoretical consideration, it is easy to show, *that they must be strongly attracting one another.*

The next step was to consider whether other fluids, as water and alcohol, would act like mercury.

But, without trying any experiment, it might be predicted, that there are certain fluids so constituted, that the attractive force exerted between them and glass, may exceed the cohesion they have for themselves. Now suppose, on laying a disk of glass on the surface of water, the disguised electricity, caused an attraction between the two substances, greater than the cohesion of the water, the result will be, that the weaker force must yield to the stronger, and on lifting the glass up it will carry with it a thin sheet of water, held on its surface by the attractive force of the opposite states of electricity, which will be still disguised, and therefore the electroscope ought not to diverge. *All which is entirely conformable to experiment.*

As this position has a very near relation to the theory of Clairaut, I endeavoured to prove the truth of that experimentally. For this purpose, I took a glass disk of a certain size, and one of copper of the same dimensions, carefully and thoroughly amalgamated; it was washed in distilled water, and made quite dry. On one side, three small rings were fastened, for the purpose of suspending it horizontally from the arm of a balance. It was gently lowered on the surface of pure mercury, in a cup, and the weight required to overcome the adhesion, noted. This weight was regarded as measuring the cohesion of mercury. After each separation, the superfluous mercury was cleared from the disk; fresh mercury was used each time.

Exp't.	1.	54	Weight required to overcome the cohesion of mercury.
	2.	53.89	
	3.	54	

The copper disk was now removed, and the glass substituted in its stead.

Exp't.	1.	24.9	Weight required to separate the glass.
	2.	25.8	
	3.	25.72	

Now on comparing these six experiments, it would appear, that in no case did the attraction of mercury and glass, amount to half the cohesion of mercury. And as mercury is depressed in capillary tubes of glass, the numbers ought, by the theorem of Clairaut, to be such as were found by experiment.

But, lest seduced by experiments which might simulate an appearance of truth into an incorrect theory, I resolved on making an experiment, which should be a severe test. This was to measure, with as much exactness as possible, whether the adhesion took place in exact proportion to the electricity developed. For if one kept pace with the other, that would be the strongest proof that could possibly be had, that one was the cause, and the other the effect. In making such an experiment we have many disturbing causes in play.

If a disk of zinc is laid on a surface of mercury, it will be evident that a separation cannot take place, without the greater part of the electricity escaping before the contact is finished, owing to the conducting power of the zinc. Hence the resulting number determined by the torsion balance, is vastly inferior to what it would have been had the zinc not been a conductor. But if we substitute a disk of glass, in place of the zinc, owing to the nonconducting power of the glass, all the electricity developed remains attached to its surface. Hence, the apparent quantity of electricity developed by the contact of glass and mercury, is vastly superior to the quantity developed by any metal and mercury, whilst in truth it may be vastly inferior. This conclusion, to which I am thus led, receives strong support from the case of a galvanic battery, and a common electrical machine, in which the quantity of electricity developed by the former is much greater than that of the latter. If the contact could be broken before the electricity developed on the surface of the zinc was neutralized, by meeting with the opposite electricity on the mercury, then we might make correct estimates of the quantity of electricity developed by contact. Now, upon making the experiment, it will be found impossible to separate the touching surfaces from each other *at once*. Suppose, for instance, a disk of zinc was partly separated from the surface of mercury, if, by the strong attraction existing between the two bodies, or other causes, the parallelism of the touching surfaces was disturbed; or if a mere filamentary drop of metal, caused a momentary communication, all the free electricity of both surfaces, would in a moment be neutralized, and the resulting quan-

tity, either as measured by the torsion balance, or the gold leaf electroscope, is merely the residuum of the very last point of contact.

This observation applies to the fundamental experiment of Volta, of the development of electricity between a plate of zinc and one of copper. If the disks could be separated, before any of the contrary electricities had time to combine, much better proof would be had of Volta's assertion. A disk of iron, laid upon mercury, showed but little electricity; a disk of zinc still less; but the electricity developed by glass was apparent, owing to the nonconducting power of the glass. Instead of doubting whether electricity is excited by contact, it is much more unlikely that it is excited by friction, which, indeed, amounts to no more than a series of successive contacts. Some may, however, object to the whole theory of electricity developed by contact, and may quote the experiments of De la Rive as decisive of the question; but I would ask such, how are we to account for the development occasioned on the surface of a disk of glass, a substance not liable to chemical action? Besides, I am satisfied, from personal observation, that the chief experiment of De la Rive is erroneous. *He* may not have succeeded in producing any accumulation in his condenser, by the contact of zinc and copper in a jar of nitrogen, for the ablest philosophers cannot *always* succeed in so delicate an experiment, but, in many trials, I have done it, and am therefore satisfied in my own mind of the correctness of Volta's fundamental assertion.

With regard to the adhesion of plates to the surface of liquids, as keeping pace with the electricity developed, the terms in which that may be shown, may not be such as a rigorous measurement would give, but are such as the case admits. I took a disk of plate glass, of a highly polished surface, and on one side of it melted some gum lac, inclining the plate so as to spread the lac evenly over the surface. Whilst the lac was in fusion, a piece of plate glass was pressed down upon it, to give it a polished surface; but, as in separating it from the polishing glass, a splinter was torn from its surface, the numbers to be mentioned are rather too small for the lac. The disk was now suspended from the arm of a balance, to determine the adhesive force on the surface of pure mercury. First, with the vitreous side downwards, and then with the side covered with lac. The numbers were:

	Glass.	Lac.
Exp't. 1. Perfectly dry	33.75	29
2. Moistened by the breath,	40	30
3. Wet	45.87	45.50

The second and third experiments were made to determine whether, when the surface was wet, a greater or a less weight would be required to separate them. From theoretical considerations, it would appear that the disks ought to adhere more strongly when water intervenes; for the rupture does not take place in consequence of the attractive force of the mercury and glass being overcome, but in consequence of the cohesion of the watery particles being overba-

lanced; this is evident, as a film of water is to be found on both surfaces; but in the last two cases, the theory would likewise indicate that the numbers determined by the balance were increasing, while those determined by the electrometer should be decreasing; and even in the last case the electrometer ought to be insensible. It may likewise be remarked, as connected with this, that the gum lac adheres less forcibly to mercury than glass, and only increases in adhesion when exposed to the same source of moisture, in proportion as one to three. Yet, when both substances *are wet*, the force of adhesion becomes the same, for then it represents the cohesive power of water. This experiment gives a salutary caution, that in attempting to compare the force of adhesion, with the electricity developed, every part of the apparatus and substances employed, ought to be free from moisture. If the proof plane of Coulomb be used, it will likewise be necessary to have regard to the conducting power of the surface under trial; without this precaution erroneous results would be obtained, arising from unequal distribution over the surface after separation; this, in circular disks, might vary from unity at the centre to 2.9 at the circumference, if the conducting power were perfect.

Having constructed disks of sulphur, beeswax, gum lac, sealing-wax, and crown glass, of exactly the same shape, weight, and dimensions, with the side that was to repose on the surface of pure mercury as highly polished as possible, I determined the adhesive force of each of these; the resulting numbers, the mean of several experiments, were as follows.

Crown Glass	55
Gum Lac	50
Sealing-wax	50
Sulphur	45
Beeswax	20

The mercury experimented upon, had been three times distilled with care; a very dry day was selected, and after all moisture had been expelled by heat, the experiments were made in a vessel containing chloride of calcium. I satisfied myself of the absence of all electricity, by the test of an exceedingly sensible gold leaf electrometer. The results afforded by a torsion balance were—

Glass	18
Lac	16
Sealing-wax	$15\frac{1}{4}$
Sulphur	11
Beeswax	7

Although these do not bear the same proportion to each other, as the numbers in the preceding table, yet they follow exactly the same order. But fearing there might be some mistake arising from the construction of my torsion balance, I took a long magnetic needle, and furnishing it with a gilt pith ball, insulated by a filament of gum lac, I noticed the effect caused by the movable ball and proof plane.

The numbers reduced to the standard of glass, in the last experiment were—

Glass	18
Lac	16.2
Sealing-wax	15.82
Sulphur	12.1
Bees-wax	7

I afterwards found that the same results might be obtained, in a rougher manner, by observing the distances at which each of the excited disks would affect a gold leaf electroscope.

The numbers thus found would probably agree better with those obtained by adhesion, if they were properly corrected. In the first place, the conducting power being variable in the different substances, will derange the result, and the expression for those in which it is greatest, ought to increase. There is another source of error, for which I see no remedy,—the attractive force exerted between glass and air; there can be no doubt, that air actually *wets* glass, and this is a circumstance of some importance to chemists. I have noticed in analysis of gaseous matter, traces of the presence of atmospheric air, which I am certain could be derived from no other source but this.

But if it cannot be rigidly proved that electricity is the cause of capillary attraction, by an exact correspondence of rigorous measures, such an opinion could be supported by no slight argument, if it was found that electricity exercised an apparent control over all the phenomena of capillary action.

Reasoning on the principle laid down, I succeeded in ascertaining in a distinct and positive manner, that electricity has complete control over chemical action, and that it can disturb the position of liquids in tubes, with the same ease, and quite as powerfully, as it can disturb the position of the magnetic needle. It might at first sight be supposed, that this could be effected by electrifying mercury, or water, in a capillary tube, furnished with a cistern, by means of a common machine; but a moment's consideration would show that this is an error. Owing to the expansive force of the electric fluid, it will, as is theoretically shown, occupy only the extreme part of the arrangement, and from this circumstance no particular result could be reasonably expected. Hence, though water be electrified in this manner, until it gives out sparks an inch or two long, it will remain in its original position in the tubes, even though the finger be approached very close to it. It is immaterial whether the electricity be positive or negative, or whether mercury or water be employed.

But whilst electricity of tension only affects the surface of bodies, electricity produced by the galvanic battery, occupies itself with their constituent atoms. It is from this source we must look for the effect. Now, if water be placed in a tube by itself, and the terminal wires of a galvanic battery being immersed in its extremities, it showed no disposition to be affected, the reason would be obvious; the attraction of capillarity is between the water and the glass tube, whilst

the electric current passes down *through the water*, without at all interfering, so as to alter the position of the suspended fluid. From this it is evident, that the tube must communicate with one pole of the battery, and the suspended liquid with the other. Further, the tube and the liquid must not only both be capable of conducting electricity, but it is also essential, that their conducting power should not be the same, or the electricity will pass from one to the other with too great velocity to cause any disturbance. To meet all these requisitions, and likewise to observe the reaction upon the capillary tube, I took a tube of glass, one-tenth of an inch in diameter, and wetted it thoroughly with water; I then placed it in a cup containing mercury and distilled water. The water rose in the tube; and on lowering it into the mercury, the mercury experienced its usual depression. The apparatus might now be regarded as a tube of water, containing mercury depressed in it by capillary attraction. I now made this tube of water positive by uniting it with a battery of fourteen Wollaston plates, and on making the mercury in the cup negative, the mercury in the tube instantly rose.

The only form in which the experiment will succeed, is when the positive pole dips into the *water* of the capillary tube, *and not into the mercury*. It is immaterial whether the negative pole dips into the mercury, or the circuit be completed elsewhere.

Some might incline to suppose, that as the rise takes place from the negative to the positive wire, it might receive ample explanation from the fact, that the electric current passing in the same direction, carries it mechanically with it. If the effect depended on this cause, the position of mercury ought to be deranged, by the passage of a stream of electricity from a common machine, but this is not the case; for strong explosions from a Leyden phial, may be passed in either direction through the tube, even at the risk of bursting it, and the position of the mercury will still remain unchanged. But the most decisive experiment is this,—if a positive platinum wire pass down the axis of a capillary tube into the water, and the tube and its wire be very cautiously elevated, whilst the mercury communicates as before with the negative wire, *at a particular position*, the water will experience an instantaneous depression, and will fall in the tube the whole length of the platinum wire. The particular position is, when the immersed extremity of the tube has just quitted the surface of the mercury, and the effect arises from an increased attraction between the mercury and the water. When a copper wire from the galvanic battery dips into mercury, it becomes wetted, and the mercury rises with a wave-like motion. But as in most other molecular actions, the phenomena are very complicated, the mercury having risen on the wire, capillary attraction, strictly speaking, is at an end; the mercury overcoming the attraction of the wire for itself. Change of capacity for caloric is the immediate result of change of composition, and heat is either absorbed or developed.

I have said, that, in the arrangement pointed out, a rise takes place; I would not, however, be understood to mean that such is always the case. That rise may be converted into a fall, and still all the

reasoning will apply. All that results from the theoretical action of a battery, is an increased pressure. This, under the control of disturbing causes, will produce a motion, but the direction of that motion is entirely governed by circumstances.

Before proceeding to the converse of this experiment, to show the depression of liquids, I may observe, that all these changes of position are accompanied by certain and definite changes of figure of the bounding surface. It appears, from the theory of Laplace, that an increase of attractive force ought to be accompanied by such a change of figure; which is the result of an equilibrium of the variable attractive force, and the cohesive power of the liquid. Reasoning upon these principles, it would appear that as the attraction between water and mercury increases towards equality, with the value of half the cohesive force of mercury, the bounding surface becomes of a less curved figure, and a rise takes place. From being convex upwards, as the surface approaches horizontality it becomes plane, and finally ends in being concave. That a rise ought to take place is shown by Laplace; for suppose the chord of the arc given by any section of the meniscus, to remain constant, the curvature of the arc becomes more and more sensible, forming a greater part of the circumference, whose radius becomes smaller and smaller, at the same time, the number of molecules contained on the bounding surface increase, and by a necessary consequence, the action of the meniscus itself increases; we may therefore assume, that, if a variation of the attractive force produces a change of figure, change of figure *may* be a legitimate indication of variation in attracting force.

In reversing the former experiment, so as to cause wetting liquids to rise higher, and mercury to be depressed beneath its usual level, regard must be had to disturbing causes, which may arise from the chemical nature of the liquids. A descent of mercury may be caused by altering the connexion of the polar wires. The mercury which, in the former experiment, was made negative, is now to be made positive, but as soon as this is done it becomes covered with a coating of oxide, which blocks up the tubes, and prevents any decisive action. Liquids capable of dissolving the oxide must be employed, and with sulphuric acid the rise and fall take place, on altering the communication. The simultaneous ascent of mercury, and descent of water, is instructively shown thus:—Place two plane plates of glass parallel to each other, so that there may be communication from their sides, with mercury and water in a reservoir. Make the water positive, by means of a platinum wire extending into the space between the glasses; on making the mercury negative, it immediately rises between the plates, and the water falls through the open sides, carrying with it any small particles of dust, or other light substance, placed there to show the path of the current. On breaking the communication, the currents return, flowing backwards, and things remain as before making the experiment.

It might here be objected, that no motion whatever ought to take place, from the elements laid down, the water having just as much tendency to descend as the mercury to rise; for, from the very nature

of disguised electricity, the positive and negative electricities are in the exact ratio for neutralising each other, which ratio is that of equality; an increased pressure only ought to take place.

This objection is easily obviated, when we remember that water and mercury differ in many respects; for instance, the inertia of the one is greater than that of the other; their action on the glass which included them, is very different, and all these things are to be considered as modifying the effect. On electrifying two substances, these trivial circumstances exercise a powerful influence, and may even determine a motion in direct opposition to what it ought to be. To chemists this is no new doctrine; these very forces, acting on this very electricity, determine so many chemical changes in direct opposition to affinity, else how can we give an explanation, that iron turnings decompose water at a red heat, and at the very same temperature, peroxide of iron is decomposed by hydrogen gas.

Aided by these considerations, I have contrived an arrangement to illustrate them experimentally. It consists of an inverted syphon, one of whose legs may be about one-tenth inch in diameter, and the other one-half inch. Mercury is to be poured into the syphon, until it rises in the smaller leg; pour upon it, in that leg, sulphuric acid; make the acid positive, and the mercury negative, and instead of a rise, a fall takes place. Change the communication, and there is a rise.

It may be remarked, that this alternation of rise and fall is decisive of the idea, that motion is produced by the mechanical action of the current; if that were the case, the motion in both instances should be alike, if the direction of the current was the same in both cases. I took the unequal legged syphon, filled with mercury and sulphuric acid, and caused the current to pass in its course along the wire of a galvanometer. The sulphuric acid was now connected by a wire passing from it, to one of the galvanometer cups; the mercury in the wide leg, had a thick amalgamated wire dipped into it, which proceeded from the negative pole of the battery. On completing the communication by a similar wire from the positive pole, the galvanometer needles traversed west. On reversing the communication, the mercury rose, and the needles traversed east. On substituting spring water for the sulphuric acid, and making the water positive, it instantly fell, vibrating about its lowest point of descent, and when it rose, vibrating about its highest. It is to be remarked, in making this experiment, that when the mercury is rising, the watery tube moves with a waving motion, between the glass tube and the mercury, and if the battery be in sufficiently vivid action, and the tube small enough, it will pass down, in direct opposition to the laws of hydrostatics, by several inches of mercury, and make its appearance in the other leg of the syphon.

I now took a syphon, whose legs were of equal diameter, and having made the water positive, and the mercury negative, there was a rise, the needle traversing west. On reversing, and making the water negative, the mercury blackened the tube, but did not move, the needles going east. Now, connecting this and the last experiment,

we find in one a current deflecting a needle westward, causing a rise, in the other, a fall. This I take to be proof sufficient that the mere motion of a current, dragging the mercury in its path, is quite unequal to produce the phenomena.

Perhaps some may imagine that a reasonable account may be rendered of this rise and fall, on chemical and hydrostatic principles. In the case where mercury rises in straight tubes, hydrogen gas is freely developed from its surface, and though most of the volatile metals are prone to form combinations with hydrogen, as tellurium, potassium, and arsenic, it, nevertheless, does not follow that these compounds must be gaseous: for instance, the solid compound of hydrogen and potassium of Gay Lussac and Thenard, and a similar compound of hydrogen and arsenic, formed by Davy. If, it may be said, an union of this nature took place between mercury and hydrogen, and the resulting compound was soluble in metallic mercury, it would, in all probability, be specifically lighter than mercury, as is the case with the ammoniacal amalgam; and on its formation it would disturb the hydrostatic equilibrium in the syphon, and a rise must take place to compensate for such disturbance. In the case where the mercury falls, why may not the hydrogen escape, and the oxygen unite either with the water or the mercury. Now from Dulong's experiments it appears, that the oxide of hydrogen is soluble to a certain extent in mercury itself, and peroxide of mercury is of greater specific gravity than water. Either of these suppositions, would account for a movement in the branches of the syphon.

In the first case, where a compound of mercury and hydrogen is assumed to be the cause of a rise, I would merely remark, that we have no warrant for supposing any such compound can be formed, and generally to the whole objection I make this reply,—The rise takes place *in a moment*, the instant the current passes, so that there is not sufficient *time* for any compound to be formed, at least not to an extent sufficient to disturb the hydrostatic equilibrium. Again, in the case of a rise in a tube of pure water, it is evident, after the current has ceased to pass, the mercury ought either to remain suspended, or slowly to disengage hydrogen whilst sinking. Now neither of these results agrees with observation; the moment the current ceases, the hydrogen drops, without disengaging the minutest bubble of gas. In repeating this experiment, care must be had that the water is pure, or at least only rendered a sufficient conductor, by substances which contain no alkaline matter; for instance, if chloride of sodium be present, the resulting amalgam will disengage hydrogen for some time after the current has ceased to pass; but even in this case, sufficient evidence may be had against this objection, for the sinking of the mercury is almost as instantaneous as its rise, and it is not until after *it has fallen*, that the disengagement of hydrogen is perceived. Again, if oxide of mercury be the cause of the fall, it should be remembered that the fall ought to be permanent. And as to peroxide of hydrogen, it is a substance so notoriously liable to decomposition, and requiring so large a volume of oxygen for its forma-

tion, that I cannot for a moment conceive any possibility of its presence at all affecting the experiment.

Again, it may be doubted, whether the current itself, or some peculiar quality of it, is the cause of these phenomena; or whether they do not arise from the electro dynamic action of the wire upon currents traversing the mercury.

On approaching a strong bar magnet in any position with regard to the apparatus, no disturbance ensues, and the poles of a powerful horse-shoe are equally inert. A battery consisting of a few large plates, though it will make the galvanometer needles turn violently round, will by no means cause that change of level, which a number of smaller plates will occasion. It therefore requires that peculiar voltaic arrangement, which is exactly suited to chemical effects. A larger number of moderate sized plates, has the most energetic action. Hence another important inference may be drawn—if, as we see the same arrangement controls capillary attraction, that is most effectual in disturbing affinity of chemical action; and if chemical attraction is identical with electricity, then there is great reason to suppose capillary attraction is referable to the same cause.

The evidence which it was my intention to bring forward, to show what strong suspicions there were for supposing that capillary attraction is due to electricity, may be regarded as complete; but a number of arguments might be adduced in addition. I would ask, what better proof have we of the truth of any scientific theory; we see that all the phenomena of capillary action may be legitimately accounted for by the laws of electricity; we see that the measure of the one is the measure of the other; that when the one increases or decreases, so does the other, in the same proportion, and that the one has that control over the other, that a cause might be expected to have over an effect. But lest, deceived by specious appearances, we should form an erroneous opinion, let us see how new facts will elucidate the matter, holding ourselves ready to forsake any theory, however plausible it may appear, the moment we find one fact that contradicts it. In doing this, I have to require a distinction to be made between things that *cannot* be explained on these principles, and those that I am unable to explain. For in treating on an intricate subject like this, where the actions of that unaccountable agent ELECTRICITY, are deeply involved, it would be vain entirely to rely on my humble ability. There was a saying of old, that it required a clever charioteer, to turn his horses in a narrow chamber,—how then shall I hope to guide such an ungovernable steed, and grope the way in darkness?

I believe it was Sir H. Davy who first noticed the convulsions of mercury, when electrified under water. In a watch glass, I placed about an ounce of mercury, and poured on its surface water, rendered a better conductor by a drop of sulphuric acid. The mercury was now made negative, and on dipping the positive pole of the battery into the water, a rotary motion was produced, exactly similar to that which would be exhibited by a current passing from a blow-pipe over the surface of the water. Now, it is to be remarked, that the arrangement is the same as when mercury rises in a straight capillary

tube; the mercury in both cases is to be in connexion with the negative pole. On reversing, and making the mercury positive, no motion is produced in either case.

As the battery I made use of in all these experiments, consisting of fourteen three inch Wollaston plates, was much too powerful when charged in the ordinary manner, I poured the exciting fluid from the cells, and replaced it by water rendered slightly saline by common salt. The action of the battery was now much moderated, and I observed, on repeating the experiment, that on making an arrangement as described, for producing currents, the mercury suddenly became more globose. On breaking the communication, it gradually dilated again, becoming a very oblate spheroid, much flattened at the upper part. At the time of its greatest convexity, a slight current was seen, carrying light bodies in its vortices, and betraying the energetic gyrations, which the particles of the mercury were accomplishing, whilst the little globule was detained, in such a state of force. On reversing there was a motion produced. It is easy to show that this change of figure proceeds from a change in attractive force of the bodies in contact. I made this experiment in another manner; I took a glass tube of such a diameter, that it would contain a little acidulated water, and a globule of mercury, without the spherical figure of the latter being deformed. In the bottom of the tube, a platinum wire was sealed; this the mercury reposed upon, and it likewise served to communicate with the negative end of the battery; on passing the current an instant deformation of figure took place. The upper surface flattened, and the mercury touched the tube all round, in a complete ring. Its surface was ploughed by gentle currents, and in the thin aqueous tube thus formed, decomposition rapidly took place.

Let us pause, to make a few useful applications of the knowledge we have acquired. Nearly one hundred and fifty years ago, Huygens saw with astonishment, that in a tube of a few lines in diameter, mercury might be made to stand at the height of seventy inches. This phenomenon is constant, when the interior of the tube is quite dry, and the mercury desiccated by long boiling. It receives an explanation on these principles. When the mercury is made to descend, in a dark room, to its usual barometric height, the vacuum is pervaded by a lambent electrical flame. This phenomenon takes place, to a greater or less extent, in all barometers; those that are most free from moisture and gaseous matter, being most liable to it. In tubes of a large diameter, it is manifested by an adhesion of mercury to the tube, which must be overcome by tapping the case of the instrument, or other mechanical means. I took a tube four-tenths of an inch in the bore, and having made it perfectly clean, I exposed it to as strong a heat as it could bear without altering its figure; whilst it was hot, one end was sealed, and the other bent like a syphon barometer. Mercury which had been distilled three times, at a low temperature, and then made to boil violently for a few minutes, was poured into it; it was again boiled for rather more than four hours. The adhesive force of the mercury to this tube was remarkable; it could never be

brought to stand at the same altitude, in two consecutive experiments. The slightest motion filled the tube with a pale electrical flame.

On the same principle may be explained an experiment, made by P. Abat, which has not a little puzzled philosophers. In a syphon, whose branches are of equal diameter, pour some mercury, so that its height in both branches may be equal. Make the mercury rise in one of the legs by inclining the syphon, and then slowly return it to an upright position; the mercury will now stand higher in the branch in which it rose, the hydrostatic equilibrium being destroyed. From the principles laid down it is plain this should be the case. When the syphon is brought to its greatest inclination, the tendency of the electricity developed by the contact of glass and mercury, is to produce a species of adhesion, and if the motion in restoring the syphon to its former position be gradual, that adhesion has time to take effect.

Dutrochet, I believe, for I have not yet seen his original work, saw that endosmosis might receive an explanation from the action of electrical currents, founded on a galvanic experiment, made many years ago. Circumstanced as I am with regard to his writings, I cannot criticise them. If, however, he supposes endosmosis is due to electrical currents, I submit that it is an error. For it appears, that a very simple explanation may be given. The liquid, whatever it may be, that has the greatest attraction for the bladder, or other porous substance, passes through by common capillarity; as soon as it reaches the upper surface of the system of tubes, it unites with the other liquid; in the case of alcohol and water, for example, the water passes through, and unites with the alcohol: this compound has not the same force of capillarity as the water alone, consequently the water still continues to rise, its upper surface being in a manner removed, by uniting with the alcohol, just as the sap continues to rise in trees, as the upper end of each filamentary column is removed, by evaporation from the surface of the leaves.

Setting out with these ideas, I attempted to determine the matter experimentally. I stretched a disk of bladder over a light metallic ring, and suspended it horizontally in equilibrio from the arm of a balance. The liquids experimented on, were taken from the same phial as had been used for verifying the endosmosis—they were, distilled water, proof alcohol, and a mixture of each. I expected that by ascertaining the force required to detach the bladder from them, I should know their comparative cohesion. From other circumstances I knew that the ratio of the electricity developed by alcohol and bladder, and by water and bladder, was something less than that of six to ten.

Exp't.		Alc.	Water.	Mix.
1.	Force required to lift a disk of bladder from	20.1	33.4	23
2.		20.1	33.1	23
3.		19.8	33	23

It appears that the water passes through bladder with a force represented by 33; whilst the alcohol only attempts the passage with a force represented by 20; of course, the greater pressure prevails, and

the water passes. On arriving at the other side of the bladder, it forms a compound with alcohol, and the backward pressure now amounts to 23. The water, therefore, still continues to rise. I have used these numbers, in a rough manner; they do not accurately express the forces, but are a sufficient approximation for the purpose of illustration.

Guided by these principles, it appeared to me, that a material improvement might be made on the common galvanic battery, if the electricity developed during the mutual diffusion of liquids into each other, was added to that developed by two metals, acted on by a chemical menstruum. To put this into practice, I made an arrangement in a glass tube, half an inch in diameter, consisting of two metallic coils, one of copper and one of zinc, to each of these a copper wire was soldered. The zinc coil was at the bottom of the tube, through which its copper wire passes, being made water tight with gum lac. The copper coil was situated at the upper extremity, and about one inch distant from the zinc. Now on putting a strong solution of muriate of soda in the bottom of the tube, and dilute muriatic acid, of less specific gravity, at the top, during the act of diffusion of these liquids into each other, a strong current of electricity, it was presumed, would pass along the connecting wires. It was with no small pleasure I observed a full corroboration of the truth of the principles on which I was reasoning; for on introducing the poles into a drop of water, instantaneous decomposition ensued with considerable energy.

A plate of zinc, one-eighth of an inch in width, and half an inch long, fitted with a similar copper plate, by the aid of the solution above referred to, is perfectly adequate to the decomposition of water. A battery of half a dozen such tubes, bears a favourable comparison with one of fifteen Wollaston plates on the old construction.

In continuation of this research, on the power that one substance possesses of penetrating into the pores of another, as nearly measured by their power of cohesion, I was led to repeat the experiments formerly made by Guyton De Morveau, on the adhesion of disks of metal, to the surface of quicksilver. The results were—

1 Gold	6 Zinc
2 Silver	7 Copper
3 Tin	8 Antimony
4 Lead	9 Iron
5 Bismuth	

Which is likewise the order of their affinity,—another proof that chemical affinity and capillary action, are to be attributed to the same cause.

In repeating these experiments, I had occasion to notice incidentally, the production of heat, the moment mercury was touched by gold. This remark was made many years ago by Boyle, as may be observed in his essay on the Mechanical Origin of Heat and Cold.

It might be predicted, from the experiments of Pouillet, that gases must exhibit the same phenomenon. A piece of red hot charcoal, when I had cooled it in mercury, and then immersed it in an atmosphere of ammoniacal gas, had its temperature suddenly raised. When it was surrounded by a mixture of atmospherical air and hydrogen gas, and

the temperature slowly raised, the heat developed by the charcoal was such, that it set fire to the gaseous mixture, acting in the same manner, though not so energetically, as spongy platinum would have done.

This principle offers an explanation of the decomposition of the peroxide of hydrogen, and persulphuretted hydrogen, by several substances which have no chemical action on them. These compounds only exist at certain low temperatures, for a heat much short of 212° Fah., entirely decomposes them. The metals, and metallic oxides, likewise act in a very energetic manner; I am now speaking of the peroxides, which do not pass to a state of higher oxydation, during the action. On dropping any of these into a tube, containing peroxide of hydrogen, an instantaneous explosion ensues, and the tube becomes hot. The decomposition takes place, in consequence of the heat disengaged by capillary action; at least, the heat which must of necessity be developed from that cause, would be sufficient to decompose the layer of peroxide of hydrogen, immediately reposing on the oxide, even if no other disturbance was in action. And agreeably to this, we find, that in many cases oxide of silver will be reduced itself, whilst it is reducing peroxide of hydrogen.

There is a point, in connexion with this, to which I would refer. A liquid cannot repose on the surface of a solid, without the disengagement of caloric. A gas cannot pass through a capillary tube without changing its temperature. Hence, in the phenomenon of endosmosis, of liquids and gases, the membranous partition is of necessity obliged to undergo a change of temperature. For this reason it is well worth the inquiry of physiologists, whether animal heat may not in a measure be traced to this source. It is impossible that such changes as take place during respiration, should proceed without exaltation of temperature, but it is equally impossible, that the phenomenon of endosmosis, taking place at every breath we draw, should proceed without exaltation of temperature in the membranous septa of the lungs, and the whole vital apparatus. From Dulong's researches it appears that, supposing all the oxygen that has passed into the state of carbonic acid, has really combined with carbon during respiration, and supposing all the oxygen which has disappeared has combined with hydrogen to form water, and that the sum of these two quantities of caloric, accurately represents the whole quantity of heat produced by the chemical changes of respiration, the amount is too small by one-tenth, and often by two-tenths, of the actual quantity.

I might now proceed to add something concerning those chemical decompositions, which may be effected by the mere action of capillarity, as exemplified in the cases of deutoxide of nitrogen, atmospherical air, and pure ammonia; and likewise to show how much these processes are controlled by the condensation of those gases. I might likewise speak of those molecular motions, which silently take place in the innermost recesses of solid bodies, and indicate the laws of the movement and equilibrium of those systems of atoms. For we are not to suppose, because the texture of solid bodies appears to be the same for many years, that there is no movement of their consti-

tuent parts. I might proceed to consider the magnitude and shape of those atoms, and how one system of them may be made to disturb the motions of another; the distance there is between atom and atom, and how it is affected by their orbital paths, and vibratory oscillations. I might show how the disguised electricity, produced by near approximation, acts on these elementary systems as a centripetal force, and how the caloric which is produced under these circumstances acts as a counterbalance to prevent their fall on each other. But so long as hypothetical considerations are involved in these researches, and until the geometrical investigation is corroborated by extensive recourse to experiment, we cannot hope to come to an undoubted conclusion.

If we look once more on the mass of evidence which appears, we shall find, that all the phenomena of capillary action may be explained according to the laws of electricity,—that electricity is produced in some of the chief cases of capillary attraction, its development keeping pace with the intensity of attraction. We shall find, that whatever disturbs the production of the one, disturbs the action of the other. That the formulas of Clairaut, developed many years ago, receive, upon this doctrine, experimental corroboration—and that the attractive force may be measured by the torsion balance. If further proof were wanted, we should find it in the complete control the galvanic battery has over the height of a column, whether of mercury or water, suspended in tubes, making it rise and fall at pleasure; and, what ought to be an argument to a chemist, this is done by that arrangement which effects that affinity, which is said to be due to electricity. The endosmosis of Dutrochet is explained, not hypothetically, but by recourse to the balance; and to show that we may employ this theory to advantage, it has proved a guide for discovering arrangements in galvanic batteries of unusual intensity. It is found that the electrical excitements of different metals and mercury, as determined by their affinity, keep pace with their capillary action. The singular evolution of heat produced by molecular action, affords another passing proof to that type—the polar connecting wire of a voltaic battery. The physiological application of this fact, is striking and important; and if any thing be wanting to complete the chain of evidence, it may hereafter be found in the power that capillary attraction possesses over chemical affinity.

Christiansville, Va., July, 1834.

FRANKLIN INSTITUTE.

Quarterly Meeting.

The forty-second quarterly meeting of the Institute, was held at their Hall July 17, 1834.

Mr. Jno. C. Cresson, was appointed Chairman, and

Mr. Samuel Hufty, Recording Secretary, P. T.

The minutes of the last quarterly meeting were read and approved.

Donations of books, models, and minerals, were received from Messrs. M. W. Baldwin, M. D. Lewis, Timothy Abbott, jr., Edward

G. Dorsey, James J. Barclay, Zac. Allen, Samuel Breck, James Ronaldson, Jos. S. Kite, John Skirving, Lieut. Chas. Gauntt, U. S. N.

The actuary laid on the tables the various periodicals which had been received during the last quarter.

The chairman of the Board of Managers read the forty-second quarterly report, which was accepted, and referred to the committee on publications.

The Treasurer made his report of the funds of the Institute for the quarter ending June 30th, which was accepted.

On motion, the conversation meetings of the Institute, were directed to be suspended for the months of July and August.

The Board of Managers, in their quarterly report read this evening, reported that a letter had been received from M. De Moléon, of Paris, France, accompanied by a diploma of membership from the Société Polytechnique, in that city, certifying the election of the members of the Franklin Institute, to be corresponding members of that society, —when, on motion, the corresponding secretary was instructed to acknowledge the receipt of the letter, and return the thanks of the Institute to the Société Polytechnique.

Extract from the minutes.

JOHN C. CRESSON, *Chairman.*

SAMUEL HUFTY, *Rec. Sec. P. T.*

Forty-second Quarterly Report.

The Board of Managers respectfully submit to the Institute their forty-second Quarterly Report:—

The period that has elapsed since the last quarterly meeting, includes but a small portion of the active operations of the institution.

The Committee on Instruction having no schools under their charge during the spring and summer months, have directed their attention to other important objects connected with their appointment, and the Board feel assured, that when the period arrives for communicating instruction, whether by means of school, or lectures, this department of the Institute will be found efficiently organized, and the Board ventures to express the hope that it will receive, as it will unquestionably merit, the warm support of all the members.

The Library is rapidly increasing,—a number of valuable books having been added during the last quarter.

The Journal of the Institute continues to be an object of solicitude with the Board, and although increasing in extent of circulation, it needs the active exertions of the members to promote its interests. Its value to the mechanic is no longer a subject of theory, but is generally admitted wherever the Journal is known; that it should be more extensively known than it is at present, is certain, and this result can only be produced by the active exertions of those who are now subscribers. Men of science generally, as well members as others, are earnestly called upon to increase its usefulness by enlarging its circulation, thereby enabling its publication at a reduced rate. The liberal compensation made by the Committee on Publication to the authors of

original communications for the Journal, should induce mechanics to contribute more generally the result of their experience or observation.

The activity displayed by the Committee on Science and the Arts, shows the wisdom of the organization given to it by the Institute. Already forty members have enrolled themselves, and its stated monthly meetings have each been attended by more than thirty members. During the intervals between these meetings, the sub-committees examine subjects referred to them, and when not acting merely as counsel to inventors, submit detailed descriptive reports on the subjects examined. Those reports are discussed, in the general meetings of the committee, at which they are subject to revision, and the question is taken on their adoption by the general committee.

In relation to the rules and regulations for the award of premiums and medals from John Scott's legacy, now vested by our City Councils in the Franklin Institute, this committee have acted with promptness. The rules reported by them, and adopted by the Managers, are herewith presented.

The necessary publication of information to inventors, has been directed by the committee, and made by the Actuary of the Institute.

The committee of the Philadelphia Society for promoting agriculture, heretofore having charge of the Scott legacy, have transferred to the Institute all the models which were received, in consequence of the reference of that legacy to the Society by the City Councils. This is a subject of deep interest to the Institute, every mechanic doubtless knows the benefit to be derived from a good cabinet of models, to which he can at all times have free access. It is confidently believed that, with proper exertions on the part of members, ours may, in a short time, equal any other in the country. The Board feel constrained to bring this subject before the members, and to urge upon each the necessity of contributing all in his power to the accomplishment of an object so desirable.

Since the last meeting of the Institute, a letter has been received from M. De Moléon, Secretary of the Polytechnic Society of Paris, covering a diploma, by which each member of the Franklin Institute is constituted a corresponding member for life, of that Society. The diploma is herewith submitted. Among the benefits to be derived from this membership, the chief, perhaps, is, that the Polytechnic Society pledge themselves to give information to their corresponding members, in regard to mechanical subjects which may be objects of inquiry, and to have patents taken out for them.

The monthly meetings, of the proceedings of which the pages of the Journal contain regular reports, continue to gain favour with the members. The last was very well attended, notwithstanding the lateness of the season. The Board would recommend that the plan adopted last year be again followed this, namely, to dispense with these meetings during the months of July and August.

(Signed.) ALEXANDER FERGUSON,
Chairman.

WILLIAM HAMILTON, *Actuary.*

Committee on Science and the Arts.

The reports of the Committee on Science and the Arts having been referred for publication, the Committee on Publications deem it right to renew the notice of the constitution of that committee, and to present to the readers of the Journal, the mode of proceeding in regard to these reports.

The Committee on Science and the Arts was constituted at the suggestion of the Board of Managers, by the annual meeting of the Franklin Institute, the following resolutions having been adopted by that meeting:—

I. *Resolved*, That the Committee on Inventions, heretofore appointed by the Board of Managers, shall be extended under the title of the "Committee on Science and the Arts," and that the number composing said committee shall hereafter be unlimited.

II. *Resolved*, That the "Committee on Science and the Arts," shall consist of such members of the Institute as shall voluntarily enrol their names as members thereof, in a book to be prepared for the purpose, and who will, by enroling their names, pledge themselves to perform such duties, to be hereinafter described, as may devolve upon them, and to sustain, by their labours, the scientific character of the Institute.

1. It shall be the duty of that committee to hold periodical meetings at the Hall of the Institute, at such times as they may deem expedient, to enact rules for their own regulation, and to appoint a member to preside over their deliberations.

2. It shall be the duty of said committee to examine, either as a body, or by sub-committees, all inventions that may be submitted, and to make detailed, descriptive reports thereon, giving their opinion with candour and impartiality on the inventions submitted, in the manner now practised by the committee on inventions.

3. It shall be the duty of that committee to conduct by sub-committee, or otherwise, such scientific investigations as may be deemed worthy of consideration, and to publish the results in the Journal of the Institute.

4. It shall be the duty of that committee, by sub-committee or otherwise, to inquire and report into the state of the arts generally, or into the state of any branch thereof, when called upon to do so, in order to disseminate useful practical information, or historical facts, in relation thereto.

5. To that committee shall be confided, in general, the scientific duties which devolve upon the institution, tending to mutual instruction, and to the dissemination of knowledge, and which are not specially intrusted by the constitution to the officers of the Institute.

III. *Resolved*, That the said committee shall be governed in the expenditure of money by the same rules as govern all other standing committees, and it shall not be competent to them to contract any debts, until they shall have been authorized by an appropriation made by the Board of Managers, upon the requisition of the committee.

IV. *Resolved*, That it shall be the duty of the chairman of the "Committee on Science and the Arts," to report the proceedings of the committee to the Board of Managers, at least three weeks previous to each quarterly meeting of the Institute, in order that the information therein contained, may be included in the quarterly report; and to report to the Institute whenever directed so to do.

V. *Resolved*. That the chairman of the committee shall be elected annually, at the first meeting after the annual meeting of the Institute.

The committee organized on the 25th of February by the appointment of a chairman, and determined to hold stated meetings on the second Thursday of every month.

The following regulations for the transaction of business, were adopted at the same meeting.

Resolved, That, until further ordered, it shall be the duty of the chairman, to preside over the deliberations of the committee; to appoint sub-committees on all investigations that may be required of the committee, subject to their approval.

Resolved, That the chairman be empowered, during the recess of the committee, to appoint sub-committees on such inventions as may be presented for report or counsel.

Resolved, That all committees on inventions shall leave their reports with the Actuary, within one week after their appointment, unless such inventions require extended investigation.

Resolved, That no report shall be ordered for publication, until it shall have been adopted by the general committee.

Those of the reports of sub-committees, which, after adoption by the general committee, are by them ordered for publication, will appear from time to time in the pages of this Journal, attested, as directed by a resolution of the committee, by the Actuary of the Institute.

The Committee on Science and the Arts now consists of fifty members.

COM. PUB.

Report on Amasa Holcomb's Reflecting Telescope.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Reflecting Telescope, manufactured by Mr. Amasa Holcomb, of Southwick, Hampden county, Massachusetts,

REPORT:—

That the following is the description of the instrument as given by Mr. Holcomb.

"The telescope submitted to the examination of the Committee of the Franklin Institute is of the reflecting kind; has a focal length of six feet; the diameter of the speculum is three inches nine-tenths; the rays of light are reflected but once; the image formed in the

focus of the speculum is viewed by a common astronomical eye piece, or by a single lens; it has also an eye piece for viewing land objects, which shows them erect. The telescope is of the same construction as those of Sir William Herschell, the observer having his back towards the object and looking directly towards the speculum. It has an advantage over those of the Gregorian and Newtonian forms, by showing the object brighter with the same aperture, there being no light lost by a second reflection. The diameter of the speculum is small in proportion to the length of the instrument; it will bear a diameter of eight inches, with much advantage for viewing very small stars, in consequence of the great increase of the light.

The magnifying powers that are used are, forty, ninety, and two hundred and fifty."

Through the politeness of Prof. A. D. Bache, the committee were permitted to compare the performance of Mr. Holcomb's reflector with that of a five feet achromatic, of four inches aperture, by Dolland, the property of the University of Pennsylvania. The instrument was also compared with a three and a half feet achromatic, by Dolland, and with a Gregorian of four inches aperture, the mirrors of which had been lately repolished in London. The short stay of Mr. Holcomb in Philadelphia, prevented the comparison of it with reflectors in the possession of other members of the committee.

On the evening of the 14th of April, the committee met by adjournment in the open lot south of the Pennsylvania Hospital, the use of which was politely permitted to the committee by the managers of that institution.

The following were the results of the comparisons:—

The moon, nearly full, was at a height to be conveniently viewed with the lower powers of the instruments: with a power of 350 in the five feet achromatic, the moon appeared bright and well defined,—with the same eye-piece, giving a power of 400, in the reflector by Mr. Holcomb, the moon was sufficiently bright, and equally well defined. The same, with the exception that the moon was more brilliant, and the field of view much greater, was remarked with the use of Mr. Holcomb's highest magnifier, giving a power of two hundred and fifty.

As an illustration of their comparative performances, it was remarked that the waved appearance of the outer declivities of the craters of some of the apparently extinct lunar volcanoes, indicating the successive depositions of the lava, was more manifest with a power of four hundred in the reflector.

The immersions of 3 and 4 Geminorum of the sixth and seventh magnitude, were observed at the same instant of time in each.

The same occurred the evening before with a star of the eighth or ninth magnitude.

The immersions, however, of two very small stars, apparently of the tenth or eleventh magnitude, were observed with difficulty in the refractor, but could not be observed at all in the reflector.

The comparison of Polaris was best seen when the moon was up in

the refractor, but in the absence of the moon it was readily seen in both.

Castor was easily divided with the lower powers of either, but in the case of this, as well as of other binary and double stars, the dark space between the stars was less disturbed by scattering rays in the reflector than in the refractor.

ε Bootes was seen double in each, but more distinctly in the reflector, μ Draconis. γ Leonis, and 4th and 5th ε Lyra, were seen distinctly double in both instruments; μ Draconis, from the equality of the disks and softness of light, presented the finest appearance.

γ Virginis, with a power of three hundred and fifty in either telescope, gave no certain indications of being double. Some of the members of the committee were of opinion that it was slightly elongated.

It was stated by the artist that his reflector would divide stars distant 3″ from each other.

Estimating the distance of the stars observed by the late observations of South, Strune, and Herschel, jr., the committee were of opinion that his instrument is adequate to the distinct division of double stars distant from each other 2″.5.

The motion of this instrument, plainly mounted, was steady, and with the finder, even without rack work, objects were easily made to range with the centre, or line of collimation of the instrument.

The position of the observers with the Herschelian telescope, was natural and easy in contemplating objects having seventy or eighty degrees of altitude, though quite constrained and inconvenient in using the achromatic.

The reflector gave a distinct view of land objects, even when within one-fourth of a mile.

Some light was lost by the position of the head, an inconvenience partially obviated by making the end nearest the object three inches greater in aperture.

The Gregorian, which probably was not a very fine instrument of its kind, bore no comparison in distinctness, or in quantity of light, with the Herschelian telescope.

From these trials, the committee are of opinion that Mr. Holcomb has been entirely successful in the difficult art of polishing specula with the true curve, which gives to the objects viewed all the distinctness of figure that is given them by the best refractors by Dolland.

In one respect, the largeness of the field of view, the reflectors by Mr. Holcomb have a decided advantage over achromatics and reflectors of different construction. The apparent diameter of the field of view in the Herschelian being nearly double that of either, with equal freedom from aberration. The quantity of light furnished by the refractor was greater with the same aperture, an important advantage in searching for, and observing very minute objects. This deficiency of light in the Herschelian for viewing faint objects near the moon, or satellites near their primaries, the committee are of opinion may be removed by enlarging the aperture of the Herschelian reflector to five or five and a half inches.

The simplicity of the method of preparing and mounting Mr. Hol-

comb's telescopes is worthy of notice, since on this plan, the artist is enabled to furnish for an expense of one hundred dollars, with plain mounting, or of one hundred and fifty to two hundred dollars, with more expensive mounting, telescopes whose performance equals that of Gregorians and achromatics hitherto imported into the country at an expense of five hundred dollars.

By order of the committee.

May 8th, 1834. WILLIAM HAMILTON, *Actuary.*

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN FEBRUARY, 1834.

With Remarks and Exemplifications, by the Editor.

1. For a *Water Wheel*, denominated the "*Horizontal Sunk Curb Wheel;*" James Pilling, jr., Waterford, Saratoga county, New York, February 3.

This is to be a horizontal wheel with a vertical shaft passing up through a penstock. The cylindrical part of the wheel may be three feet in diameter, and a foot in depth; this is to be surrounded by wings, or buckets, either straight or curved, the cap or top plate of the wheel forming a circular cover, or flanch, which extends about half an inch beyond the extreme edges of the buckets. This wheel is to be let into a circular curb of wood, or of iron, which is to fit nicely, the projecting flanch forming a joint as nearly as may be water tight. The water is to be let on to the wheel, tangentially, through three or four openings in the surrounding curb, a circular channel being provided for that purpose, and each opening being furnished with a wing in the channel, to give the water a proper direction. The water, after acting upon the buckets, is to escape through openings in the bottom of the curb. The head of water acting upon the flanch, or horizontal rim, which forms the cover of the buckets, presses it upwards, and prevents all undue friction upon its centre.

The claim is to "the method of introducing the water upon, and discharging it from, the wheel, by the arrangement as above described. The combined arrangement of the curb and wheel, by which the latter is buoyed up by the water in its action upon the under side of the flanch, and the bottom step relieved from the friction, without any waste of water, loss of power, or extra expense of machinery."

This resembles other wheels for which patents have been obtained, although we are not aware that its exact likeness is to be found upon the files of the patent office. The mode of letting on the water, however, is not new, and the principle of sustaining the weight of the shaft and its appendages by the upward pressure of the water, has been repeatedly applied and variously modified.

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2. For an improvement in the *Mode of Building Bridges;* Jonas Snyder, Union county, Pennsylvania, February 3.

We do not perceive the points of novelty in the proposed mode of framing wooden bridges, but think that in its general principles, and

in the manner of arranging the various parts, it does not differ from such as are well known; the patentee has not put in any claim, but merely informed us of his mode of procedure. A good drawing accompanies the specification, showing very clearly the manner in which the timber is put together; our inability, therefore, to designate the points of novelty, does not arise from any defect in that part, but from their not being designated in the specification, as the law requires that they should be.

The bridge, we are told, is to be framed with double wooden cords, posts, about eight feet apart, running up from them to the plate, the posts being so set as to lean outwards each way from the centre. One, two, or more arches are then to be formed by tie braces which run from post to post, into mortices prepared to receive them, and in which they are confined by suitable keys. The lower of these arches is commenced on the end posts, against the piers, about four or five feet below the cords, rising in a regular arch through the whole of the posts. A second such arch may be commenced immediately above the cords. The floor is to be furnished with horizontal arches passing through its cross sills, forming braces, and keyed in the same way.

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3. For a *Thrashing Machine;* Theodore Smith, Enfield, Tompkins county, New York, February 3.

We readily admit this into the numerous family of cylinder and concave thrashing machines, a right which it may claim on the principle of precedent, which we are not, upon the present occasion, inclined to dispute.

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4. For an improvement in a machine for *Making Rovings of Hemp, Flax, or other fibrous substances;* Daniel Treadwell, Engineer, Boston, Massachusetts, February 3.

This patent is taken for a drawing head, to be used in drawing out the fibres of hemp and flax; it may be appended to the machinery carrying the hatchel and bobbin belts, formerly patented by Mr. Treadwell, or it may be added to other machinery for a like purpose. Were we to attempt to describe it without a drawing, we should not probably, succeed in giving an adequate idea of its construction, and shall therefore pass it over at present without further notice than to observe, that it appears to be well adapted to effect the important and difficult purpose for which it is designed.

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5. For a *Bee Hive;* Samuel Morrill, Dixfield, Oxford county, Maine, February 4.

Within a hive of the ordinary form and dimensions, there is to be a partition, or shelf, perforated with holes for the bees to pass through; over these holes are to be placed inverted glass tumblers, within which they are to form their combs. What the patentee claims as his invention is, "the use of glass tumblers in which to receive the honey, and the manner of preparing the partition plate." If the inventor of

this *novel* mode of collecting honey, were the possessor of all that article, and its accompanying wax, which has been obtained in similar glass vessels, he would have no occasion whatever to regret the entire worthlessness of his patent, as he might undoubtedly freight several large vessels with the contents of his store-house, and live comfortably on the returns for the remainder of his days.

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6. For a new *Machine to be used in Rope Making*, and which is denominated an "Iron Tail;" Daniel Treadwell, Boston, Massachusetts, February 5.

In the business of rope making, what are called rope tails are used for the purpose of holding back the "top," so that the proper quantity of turn may be given to the lay. In the instrument before us, the strands to be laid are pressed upon by iron bolts, which move in suitable slides upon a flat disk, so that their ends are directed towards the centre of the disk, through which the strands are to pass. The bolts have grooves, or hollows, on their ends, to embrace the strands with sufficient force, which force is regulated by screws, fixed upon bow springs, and bearing against the outer ends of the bolts.

The patentee observes, that "various modifications may be made in the different parts of the machine, or instrument; but declares the character of this invention to be comprised in the construction and use of rubbers formed of some solid body, by which they are capable of preserving their own figure, and of constraining the rope over which they pass, to assume the figure defined by them."

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7. For a *Molasses Gate;* Charles Goodyear, city of Philadelphia, February 5.

This differs but little from the molasses gates already in use for drawing that fluid from hogsheads. The gate slides up and down in grooves, and is raised and depressed by a rod: the improvement consists in adding to it a spiral spring, and two friction rollers; the spiral spring is contained in a cap in the centre of the gate, and, by bearing against the latter, keeps it close against the opening through which the molasses is to flow. This cap is not attached to the gate, but to two arms which cross it, and which are connected by pins in such a way that the spring may, by its reaction, produce the intended effect; upon each end of this arm is a small friction roller bearing against the front edge of the groove in which the plate slides, in order to take off the friction. The only things claimed are, the spiral spring, and the friction rollers. The former will, we think, answer a very good purpose; the latter will probably be laid aside as unnecessary; they render the apparatus more complex, whilst in an article such as this, lubricated by molasses, and yielding to the action of a spring, the friction will be but small.

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8. For *Branch Pipes for Fire Engines*; James Riley, Boston, Massachusetts, February 6.

Branch pipes, the patentee states, are usually made of copper, or

other metal, and covered over with leather or cord. Instead of using a metallic tube, he employs one made principally of leather, but enclosing a wire wound spirally. He takes a rod of wood of the proper taper and size for the inside of the pipe, and to the larger end of it adapts a screw, which is to fit the engine, and to the small end one to receive the nozle. He then sews leather round the rod, embracing in it the shanks of the two pipes. A tinned wire is then wound spirally upon this leather, from end to end; the wire may be about number nine or ten, and the coils about three-eighths of an inch apart. The wires are to be united to the leather by back-stitches, and the spaces between the turns filled with a composition of India rubber, spirits of turpentine, linseed oil, and lamp black. When this has been done, another covering of leather is to be put on and firmly sewed.

The advantages to be derived from a branch pipe thus formed result from its flexibility, in consequence of which the water can be sent in directions which it could not receive from a straight pipe. When a hole has been cut through a roof, or when a fireman is standing upon a ladder, it is often impossible to direct the straight pipe effectually into the opening, or window. "How difficult the task," says the patentee, "to attend to the fire, his footing, in changing from one side to the other, and his pipe; but these difficulties are completely obviated in this improved pipe; the holder commands every point of the compass, with the simplest ease, and without the necessity of moving his body; 'tis his protection from the raging flame, and though duty should call him to the midst of the furious element, his pipe is his shield," &c. &c.

Notwithstanding this eloquent advocacy of a leather branch pipe, we are of opinion that one of copper, altogether inflexible, is to be preferred. We know something of branch pipes, by experience, and therefore speak with some confidence. Their flexibility would generally be a real disadvantage, in an attempt to direct the water to a particular point; and when they were wanted to be used in a curved form, the force of the water in passing through them, would tend to straighten them; for a purpose such as the patentee has indicated, we should prefer to have a curved nozle to screw on, which the engineer might carry in his pocket.

The claim is to "the construction and use of the peculiar kind of pipes, and the several parts thereof, in combination, for the purposes aforesaid."

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9. For *Tanning Hides and Skins;* George Burr, Watertown, Jefferson county, New York, February 6.

The hides, or skins, are to be submitted to the action of beating, or pounding, in, or by means of, any kind of apparatus which will answer that purpose, they being at the same time immersed in the ooze, or tanning liquor. The best means of effecting this, is said to be the employment of the common fulling mill; the hides being put into the trough and acted upon as is usually done with cloth; the ooze, or tan-

ning liquor being put in with them, and renewed as it becomes exhausted. By this action, the hides, or skins, will, it is said, rapidly absorb the liquid, and become perfectly tanned in a few hours.

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10. For an *Evaporating Furnace for Salt Works;* James Colquhoun, Charleston, Kenhawha county, Virginia, February 6. (See account of this patent among specifications.)

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11. For a *Washing Machine;* Uriah L. Clark, Manor Township, Lancaster county, Pennsylvania, February 6.

A hollow cylinder, which is to contain the clothes to be washed, is to revolve within a trough. It is to be perforated to admit the suds from the trough, and furnished with pins and slats on the inside, to raise the clothes, and dash the suds about; the claim made is to "the above described machine, and the arrangement of its several parts."

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12. For a *Machine for Cutting Sausage Meat;* Valentine Glass, Funk's Town, Washington county, Maryland, February 6.

The meat is to be placed in a circular trough, which is made to revolve horizontally within a suitable frame. A bevelled cog wheel, turned by a crank, gears into a similar wheel which lies horizontally on a cylindrical bed, that forms the centre of the trough. Circular knives, placed upon horizontal shafts, revolve within the trough, their edges bearing against the bottom; the shafts are driven by small wheels which gear into the horizontal wheel before mentioned. There are scrapers fixed for cleaning the knives, and the sides of the trough, as they revolve, and contrivances for throwing the meat under the knives. The whole apparatus is described and figured; no part, however, is claimed, either in its individual character, or general arrangement.

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13. For a *Machine for Dressing Feathers;* George Reynolds, East Hartford, Hartford county, Connecticut, February 7.

This machine has, exteriorly, very much the appearance of a large cylindrical coffee roaster. A cylinder of sheet iron, which may be three feet long, and eighteen inches in diameter, has a shaft through its centre, which revolves freely within it, and from which projects a number of pins that may be formed of wire, and of such length as nearly to touch the cylinder. The shaft is of wood, but iron gudgeons from its ends pass through the heads of the cylinder, and one of them receives a crank by which it is turned, the shaft lying horizontally. A door, extending the whole length of the cylinder, opens on one side of it, to admit and discharge the feathers. This machine is to be placed where a fire, the heat of which can be properly regulated, may be placed under it. The feathers to be dressed are first washed quite clean, and suffered to become half dry; they are then placed in the machine, and exposed to the action of a moderate heat, whilst the machine is made to revolve; in this situation they are to be allow-

ed to become perfectly dry, which will be known by the ceasing of the issue of steam through small openings left in the heads for that purpose. It is said that however dead and matted the feathers may have been, they will, by this process, be rendered quite lively; and, whether old or new, they will be equally light, and deprived of every bad smell.

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14. For an improvement in the *Machine for Blowing Glass;* Thomas Bakewell and John P. Bakewell, Pittsburgh, Allegheny county, Pennsylvania, February 8.

On the 14th of December, 1832, Joshua Laird obtained a patent for a machine for blowing glass, and the present patent is for an improvement thereon, which improvement is said to consist in the application of the air condensing apparatus of his machine, and its flexible tube, in connexion with a common glass blower's pipe, upon which a portion of melted glass has been partly fashioned, previously to the introduction of it within the mould or die in which the required article is to be formed.

The insertion of the claim will give a sufficiently clear idea of the improvement. "What we claim as our invention and improvement on the '*machine for blowing glass, patented by Joshua Laird, on the 14th day of December*, 1832,' is, the application of air compressed in a cylinder, or by a pair of bellows, as described by him in the specification attached to said patent, conveyed through a flexible or jointed tube, or pipe, to the end of a common glass blower's pipe, upon the other end of which a portion of melted glass has been previously collected, and the article partly fashioned, which piece of soft glass, when placed in a suitable mould, is by the air so compressed, forced into the cavities of the mould, whilst it is in connexion with the said common glass blower's pipe."

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15. For a *Radiator, or Globe Stove;* Walter Hunt, city of New York, February 8.

The appearance of this stove is peculiar, the body of it being a hollow globe, supported by a column, and having two columns, one on each side of it, which support an arch passing over the body of the stove. The fuel is to be put in at top, an urn that surmounts a cylindrical opening, which stands in the place of the key stone of the arch, being removed for that purpose. The grate is placed at the bottom of the globe, and consists of bars which are convex upward, and is supported by a centre shaft that descends through the column under the globe; this shaft has on it a rack, which, by means of a pinion, may cause the grate to vibrate up and down for the discharge of ashes, which fall through the column into the ash pit below.

"The improvements claimed are as follows. First, the style, general arrangement, and fashion of the above described RADIATOR, *or Globe Stove;* believing the peculiar advantages of said arrangement in the generating and equal diffusion of heat, exclusively confined to the globe, or spheroid, form, as a reservoir of fuel, for the following rea-

sons, viz. it is the only form from which heat can be equally radiated, and consequently it has the peculiar advantage of imparting one-half of its heat downwards, warming the floor and lower region of atmosphere, which cannot be effected by the angular or cylindrical stove.

"Secondly, I claim the spheroid or hollow globe, or inverted hollow cone, for the bottom section in particular, as a reservoir of fuel, and radiation of heat, in combination with the vibrating and hoisting grate, as above specified, together with the said central hollow column, which prevents the escape of ashes into the room in its descent from the globe to the ash pan.

"Thirdly and lastly, I claim as my improvements separately, and as a part, the rack and pinion, or vibrating and hoisting grate, as before specified."

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16. For *Cast Iron Sleigh Shoes;* Lot Brees, and Ezra Brees, Luzerne county, Pennsylvania, February 10.

The patentees denominate their contrivance "the double grooved and mitred lock sleigh shoes." The shoes are to be made in three nearly equal lengths, and they are to be fitted together by mitred joints, and tongues, and sockets, cast on their ends; on the upper side, which lies against the runner, there is to be a rib, or fillet, which is to pass into a groove. These pieces are to be bolted on, the bolt holes being strengthened round where they would otherwise cut off the fillet. The claim made is to "the double lock, in every form, together with the grooving upon the ends and top of the shoe."

Cast iron shoes have been before made in pieces, and we perceive no difficulty whatever in fixing them on to the runners, so as to form good joints without interfering with the special provisions made by the patentees.

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17. For *Cast Iron Sleigh Runners, and Cast Iron Knees;* Nathaniel Benedict, jr., and Abel Benedict, Salisbury, Litchfield county, Connecticut, February 11.

The claim in this case is to "the making the entire runners and knees of sleighs of *cast iron*, instead of wrought iron, or any other material." There is nothing peculiar in the form of the runners, or knees, or in the mode by which they are attached to the body of the sleigh. We have frequently observed that we do not believe the mere change of material is a subject for a patent, and it is acknowledged in the specification before us that such runners and knees have been made of wrought iron.

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18. For *Locks and Bolts without Springs;* Henry C. Howells, Putnam, Muskingum county, Ohio, February 10.

Although this patent is taken for a very important article, the door lock, the specification of the invention does not contain more than four score words. We are merely informed in it, that the bolt is to be projected by a lever, or weight, by means of joints and cogs, or

without either; that there is a moveable weight inside of the lock, which operates instead of a spring, and that in other respects it is like other locks. Thus ends the specification, without any claim. The drawing, however, has ample references to the various parts of the lock, making its construction completely known; and we are sorry to say that there is not any thing in it which we are able to praise, although we believe it to be, in many respects, new. The object of a lock is security, and when patents are obtained for improvements in them, it is usually proposed to attain this end in a more perfect manner than had been previously done; we, however, have rarely seen a lock which we would more willingly undertake to pick than that before us. It is without springs, it is true, but *qui bono?* is a proper question upon such an occasion, and one which we could not answer satisfactorily.

The bolt is to be turned by a handle, like that to the spring bolt of an ordinary lock, but there is to be a small wheel with cogs upon the shank, which take into corresponding cogs upon the bolt. Another bolt is to be acted upon by the key, and this, when shot forward, fixes the first bolt in its place, so that it cannot be turned by the handle. Instead of the spring tumbler that falls into the notches on the upper part of the bolt, there is a weighted, sliding tumbler, which, most certainly, is no improvement; as, among other objections, it will very soon, from the thickening of the oil, and the insinuation of dust, refuse to fall by its own gravity.

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19. For a *Worm for Stills;* John G. Webb, Waterford, Saratoga county, New York, February 11.

The still worm, which is the subject of this patent, might very well be called a tape worm, as, instead of being round as is usually the case, it is to be flattened, and in this consists its only difference from those in general use. The patentee has set forth certain advantages which are to be produced by his worm, which completely transcends our philosophy; it does not follow, however, that this will be the case with that of others, and we will briefly, therefore, present the reader with some of his statements. He says that "when the liquor, of whatever kind it may be, begins to evaporate and rise, the lighter particles continue their course at the upper part of the worm, while the aqueous substance, being much heavier, will descend, and recede back into the still, boiler, or kettle." It is further said, that "if a quantity of steam and vapour containing spirit and water, be admitted into a cylindrical worm, the moment it enters the worm, *the whole vapour becomes twisted and rolled together*, consequently the light and heavy vapour becomes mixed, and their specific gravity being heavier than the vapour ascending behind, it returns back into the still. But the flat worm gives the vapour an opportunity to ride off, in the same manner that light and heavy substances float in the atmosphere."

Now, certainly, however puzzled the light and heavy vapours may be by their being twisted and rolled together in a cylindriacl worm, they cannot be more so than we are in attempting to accompany them, with the patentee, through their evolutions and contortions, and, as

we do not entertain the slightest hope of being able to unravel the mystery, we think it most prudent to "give it up."

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20. For an improved mode of constructing the *Cylinder of a Thrashing Machine;* William H. Weed, city of New York, February 11.

The whole cylinder is to be constructed of wrought iron; for this purpose, three circular pieces are cut out of sheet iron, of about one-fourth of an inch in thickness, and of the diameter of the intended cylinder. Two of these form the heads, and the third is intermediate between them; the whole three are to be placed on a square bar of iron, the ends of which are rounded, and constitute the gudgeons on which the cylinder turns. The beaters consist of bars of iron usually of a square form, their ends passing through, and being rivetted into the heads close to their peripheries: they pass also, through the middle plate, extending to its outer edge. It is recommended to place them in an oblique position, but the claim is not founded upon this or any other particular construction, but upon the making "the cylinder of a thrashing machine entirely of wrought iron, in the manner described; and that independently of the number or position of the beaters, or of the manner of constructing the concave and the other parts of the machine.

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21. For a *Churn,* to be made of tin; Thomas E. Warner, Dublin, Hartford county, Maryland, February 11.

The only difference between this and the barrel churn in common use, is, that it is made of tin plate. A cylindrical barrel is placed upon a suitable stand, and dashers are made to revolve within it, in the ordinary way. The patentee would have been at some loss in making out a description of any respectable length, had he not furnished us with the dimensions of the particular parts in inches, and parts of inches; he has not made any claim, not even to the tin.

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22. For an *Apparatus for Heating Water*; Isaac Thorn, Bordentown, Burlington county, New Jersey, February 11.

This apparatus is to be applied to the heating of water for the scalding of hogs, and the washing of clothes. It consists of a wooden trough or cistern, the bottom of which is constituted of a metallic cylindrical furnace, and a smoke flue, which run the whole length of the boiler. When used for scalding hogs, there is to be a wooden frame, with slots, upon which they are to be sustained, and protected from contact with the metallic bottom, rollers, and other contrivances to facilitate the moving of the carcases, when under the operation of scalding. The claim is to "the combination and arrangement of the several parts described." There is no novelty in the most important part of this contrivance, namely, in the forming a trough, with sides of wood, and a metallic bottom, for heating water; if, however, the patentee succeeds in uniting the two together so as not to be sub-

ject to leakage, he will be more successful than those persons have usually been who have made similar attempts.

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23. For an improvement in the mode of *Propelling Saws in Saw Mills*; Stephen R. Morrison, Kinzua, Warren county, Pennsylvania, February 11.

The patentee thinks that his mode of moving a saw frame is so superior to that generally followed, by means of a crank and pitman, that it will be well to remove these contrivances, and the water wheel also, from mills already constructed, and to substitute his patent contrivance. We have the misfortune, one of a kind to which we are very liable, to differ entirely from him on this point, as we think his mode of communicating motion one of the most objectionable, whilst, at the same time, it has not the merit of novelty.

A vertical shaft is to be driven by means of a reaction wheel; on the upper end of the shaft there is to be a drum, or cylinder, around the periphery of which is a thread or fillet, of cast iron, passing up and down in a scolloped form. On the lower timber of the saw frame there is to be a piece of iron or steel, with a groove in the head of it, to receive the fillets of cast iron; this piece is to swivel in a socket that the groove may adapt itself to the varying inclinations of the fillet. The drum, when turned by the reaction wheel, will, from its construction, give a reciprocating motion to the saw frame, but with a degree of friction much surpassing that of the crank and pitman. We are assured, however, that a mill of this construction, with only two feet head of water, will be equal to others with a six feet head. The patentee does not directly claim the principle upon which the vibrating motion is communicated, but in this point he shall speak for himself.

"I claim as my particular invention, the manner of attaching the horizontal wheel to the bottom of the saw gate, by means of the cast iron segment constituting the thread upon the segment with an angle;—and the grooved swivel, or tumbler, of cast iron, placed through the bottom of the saw gate, which turns to accommodate itself to the thread of the segment, by means of a gudgeon—thereby dispensing with a crank and pitman in saw mills upon the reaction water wheel principle; with all cog wheels, pitmen, cranks, bearer, tail, head blocks, and binders;—and the same can be used in saw mills that are carried by steam, as well as water power."

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24. For an improvement in *Spring Riding Saddles;* Richard Harrison, an alien who has resided two years in the United States; city of New York, February 11.

The improvement here patented consists in the substitution of whalebone springs or bars, for steel or other springs which have been used in that part of the saddle tree, denominated the bars.

The proposed mode of employing the whalebone, is to cut out the bars of the common saddle tree, leaving only the head and cantle, and such portions of the bars near the cantle, as may be necessary to

give to the saddle its usual shape when finished, and then to place bars of whalebone instead of steel, or others, securing it in the situation occupied by that part of the tree which has been removed. The pieces of whalebone should be about sixteen inches long, two in width, and half an inch thick; and after fixing them, the saddle is to be finished by stretching webbing in a proper manner, as is done in other spring saddles, and applying the ordinary stuffing and covering.

The claim made is to "the substitution of whalebone bars or springs, in the tree, or frame, of the saddle, in the place of wood, steel, or any other material heretofore used in riding saddles."

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25. For *New American Silver*; John H. Haggenmacker, an alien who has resided two years in the United States; city of Philadelphia, February 11.

This patent is taken for a new composition of matters, which is intended as a substitute for silver in the manufacture of various articles. The following are the ingredients employed, and the proportion in which they are to be used:—

Copper	3 lbs.	0 oz.
Silver		1
Zinc	1	4
Cobalt		½
Nickel		12
Manganese		2
Tin		1
Iron		½

These materials are to be completely fused, when, it is said, 5 lbs. 5 oz. of the compound will be obtained; in this there must be some error, as the foregoing ingredients will not combine together without loss, more especially as one of the articles, the manganese, is added, we presume, in the form of an oxide, for it is not probable that the patentee has ever seen two ounces of it in the metallic state.

The German silver, now extensively manufactured, and a beautiful substitute for the precious metal, is a compound of copper, zinc, and nickel. This is now for sale, in sheets, in this country. The French also manufacture a metallic compound, which they denominate Maillechort, that has a similar character, and according to its analysis consists of the same materials, with a trace of iron and of arsenic. The patentee, if he can sustain his patent, is confined to the proportions which he has indicated, and judging from the recipe and from the appearance of the manufactured articles that we have examined, his composition does not possess any advantage over the combinations previously made.

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26. For the *Application of Steam and an Endless Screw in Propelling Machinery;* John Ingham, and Julius Davis, Fabius, Onondaga county, New York, February 12.

The patentees allude to a globe, or cylinder, steam apparatus of their invention, and described in the Mechanic's Magazine; we, how-

ever, need not refer to this, but shall describe the instrument as patented. A hollow shaft is to revolve on gudgeons, and a part of this shaft is to be enlarged so as to form a globe, or cylinder. From this globular part, arms are to project at right angles to the axis of the shaft, which arms are to have orifices at their sides, near to their extremities, from which steam, admitted into the shaft, is to issue, and, by its reaction, to cause the shaft to revolve. There may be four such arms, in two of which the orifices may be so made as to operate in a different direction from the other two, there being a suitable division in the globe, or cylinder, to govern the steam in its course to either pair of arms. Steam may be admitted into either end of the shaft from an ordinary boiler, and, to increase the elasticity of this steam, it is proposed to admit a portion of the waste heat from the furnace into a case, or box, surrounding the globular body. Fire, if required, may also be made within this box, with the same view; this constitutes the steam part of the machinery.

In order to use the power thus generated, there is to be an endless screw upon the shaft, which is to gear into a toothed wheel, from the shaft of which the desired communication may be made. This engine, we are told, may be used for propelling boats, for driving mills, for moving carriages upon rail-roads, raising vessels on marine rail-ways, &c. &c. The claims are to the use and application of an endless screw in the manner, and for the purposes mentioned; the manner of using the globe, or cylinder, and exposing it to the escape heat of the boiler; and a valve, or damper, by which the escape heat is directed upon, or diverted from, the globe; the method of changing the direction of the motion; and "the producing of a given degree of power by the use of steam with less expense of fuel or machinery, and with less danger of explosion, than in any of the methods heretofore practised or known."

Although this engine *may* be used for the various purposes designated, such an employment of it will not be the result of an intimate acquaintance with steam power, or that of mechanical arrangement. A less efficient way of using the former has rarely been proposed; and why this power should operate through the intervention of an endless screw, it would not be easy to tell, unless there is some hidden mystery in its action, with which we are unacquainted. A pinion, or spur wheel, upon the shaft, would prevent all that lateral thrust from the screw, to counteract the effect of which the patentees throw away a corresponding portion of their steam power, by making the orifices on the arms oblique, that the steam may issue in a direction which will counteract the thrust.

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27. For a *Machine for Hulling Cotton Seed;* Lyman D. Coverly, Weathersford, New London county, Connecticut, February 12.

A stone, like an ordinary mill stone, of about three feet in diameter, is to be fixed upon a shaft, or spindle, so that it will revolve horizontally, its face being picked perfectly true and fine. A flat stone is

placed above this, so as to cover more than half its face; and the seed to be hulled is put into a hopper over the uncovered portion of the revolving stone, and carried under the above named flat stone, the distance between the two being graduated by a bridge tree. To cause the seed to be fed on to the revolving stone, a revolving cylinder, having pins in it, is placed within the hopper, and acted on by a whirl and band.

Messrs. Follet and Smith, of Petersburg, Virginia, have patents for machines for hulling cotton seed, in which they accomplish the object by rubbing the seed between two stones, one of them a revolving cylinder, the other a concave segment; we have not at hand a copy of the specification of one of their improvements, but we are mistaken if it does not contain a mode of feeding from the hopper similar to that above described.

28, For a *Water Wheel;* William Shepard, Gibson, Clearfield county, Pennsylvania, February 12.

There are some things which improve, and some which deteriorate, by age, whilst others remain unchanged during their whole career; and although mechanical contrivances do not belong to the latter class, the principles upon which they are dependent are coeval and coexistent with time and nature. Against these principles the contrivance before us has heretofore been found to sin, and the offence being against laws like those of the Medes and Persians, its former sentence of *non compos*, remains unchanged. Had the patentee looked upon the shelves of the patent office, or had he been advised of what is to be seen there, he certainly would no longer have accounted his invention *new*, although it might have been necessary for him to expend some time and money upon it in order to convince himself that it is not *useful*. The contrivance is a shaft running upon gudgeons, with any convenient number of paddles, or floats "at a proper angle with the shaft and current, the paddles being of the best shape to act on the water." The shaft, with its paddles, is to be placed in a trough through which the water runs, or in a current, or, when for propelling, under the keel of a boat. The claim is to "the peculiar conconstruction of the water wheel, as before described." Although there are several other persons who had previously claimed the same thing, we would for a very small premium guarantee this last claimant against the result of all suits for an infringement of vested rights.

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29. For a *Thrashing Machine;* William Morgridge, Chesterville, Kennebeck county, Maine, February 12.

A cylinder, twenty inches in diameter, and two feet long, covered with punched sheet iron, is to revolve in a suitable frame; five smaller cylinders, two and a half inches in diameter, are placed above this, in the manner of those in a carding machine; four of these are covered in the same manner, the other is left smooth. The cylinders are capable of adjustment as to distance, and are to be turned by bands and whirls. When used for the seeds of grasses, a concave

segment of punched sheet iron covers the main cylinder for eleven inches of its width; the feeding is effected in the usual way. The claim made is to the whole machine, with the exception of "the crank, bands, posts, cloth aprons and whirls."

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30. For an *Improvement in Naval Architecture;* Christopher Hoxie, city of New York, February 13.

The principle of construction here intended to be patented, consists in the employment of two long, parallel, hollow tubes, made air tight and water tight, connected together, and propelled by sails, steam, or otherwise. The experimental boat to test its efficacy, had two hollow, air tight, tubes, made square, and pointed at the ends; they were about thirty feet long, and ten inches in diameter. A deck was mounted on a suitable frame, and both paddle wheels and sails tried upon it. The tube, it is said, may be of any form, and may be divided internally into several compartments, so that any accidental injury shall not affect it in its whole length.

The points claimed are not stated, and although this patent has been obtained somewhat earlier than that of Mr. Burden, of Troy, for a structure somewhat similar, we are very apprehensive that in this case "the first shall be last and the last first."

From the models which we have seen arriving at the patent office we are apprehensive that young as is Mr. Burden's boat, it has already a numerous progeny, some of whom have taken the precaution to smut their faces, that their relationship may not be at once apparent; perhaps, however, when they are washed, and appear in their true colour, their affinity may become manifest.

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31. For a *Thrashing Machine;* John P. Williams, Eldbridge, Buckingham county, Virginia, February 13.

This thrashing machine has the same general form with those of the cylinder kind, so frequently described. There are teeth upon the cylinder, surrounding it spirally, which are arranged somewhat differently from most others, but not so as to vary their effect, the main difference being in the teeth of the concave segment; these are placed in rows, on separate bars, which turn upon gudgeons, so that when subjected to any unusual force, they will bend down before it, one of the gudgeons of each bar being operated upon by a spring, or some similar contrivance, by which the bar is restored to its proper position.

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32. For an improvement in the *Printing Press;* Daniel Neall, city of Philadelphia. First patented November 15, 1825. Patent surrendered and reissued under an amended specification, February 13.

We shall not give any description of this press, as it is to be found, with a plate, in the American edition of Nicholson's Operative Mechanic. In the original specification there was not any claim made, and the omission is now supplied in the following form:

"The peculiar advantage of this press is, that the power by which the inking process, and the removal of the printed sheet, are effected, is obtained from the necessary movement of the bed; and of this improvement, whether effected precisely in the manner specified, or in any other operating upon the same principle, and producing a similar effect, I claim to be the inventor."

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33. For a *Press;* Jesse Cramton, city of New York, February 18.

The description of this press is meagre and defective in the extreme, and although it is accompanied by a good drawing, this is without written references to its respective parts. The power is to be communicated by the turning of a shaft, which is situated at the upper end, close to the cap piece. This shaft has on it either two or four eccentrics, to operate upon a double rack, or racks, which rise from the follower. When there is but one double rack, it rises vertically from the centre of the follower, the cams, in this case, being on the centre of the shaft. Two sliding boxes, one on each side of the rack, are alternately raised and depressed by the cams, and these sliding boxes have teeth on them which, as they descend, catch upon the teeth of the racks. When there are four cams, there are two such double racks, one placed near each cheek of the press. The parts claimed "are those which cause the continued pressure, which is the application of the racks and sliding blocks to the cam press.

We do not perceive any advantages offered in this press above those in others now in use, and although the double rack may not have been applied in precisely the same way, the principle has been known and used for more than a century; and, according to the form of the claim, it would appear that the patentee does not confine himself to his peculiar arrangement.

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34. For *Wire Covering for Window Frames;* James Sellers, city of Philadelphia, February 18.

This patent is taken for the employment of the ordinary wove wire, with square meshes, in the covering of frames for cellar windows, in such a way as to make it resemble in appearance that kind of wire work, with diamond formed meshes, which is made by hand. The wire is to be woven in the usual way, cut into the proper form, and the square stretched diagonally, so as to produce the intended effect.

"What I claim as my invention," says the patentee, "and for which I ask a patent, is the affixing to frames for cellar windows, and for other purposes, of wire wove with square meshes, when extended so as to form rhombs, or diamond formed openings, which shall stand with their opposite angles in the same vertical and horizontal lines; thereby giving to them an appearance similar to those frames which are covered with wire work prepared by hand, and having the meshes in the form described."

35. For a mode of *Preparing Hard Tallow, or Stearine;* Carl G. Ritner, Cincinnati, Hamilton county, Ohio, February 18.

Fifty pounds of tallow, two of sulphuric or of nitric acid, and twenty-five of rain water, are to be boiled together, and kept constantly stirred for an hour. They are then to be poured into a strong wooden tub, with a close cover, and to remain at rest, gradually cooling for twenty-four hours, in which time the oily and solid parts will separate, the latter being granular. The whole is then to be placed in a suitable case, or tub, to be pressed, the bottom and sides of said tub being perforated, and a cloth sufficiently large to surround and cover the materials being first laid within it; willow hurdles are also to be placed between every layer of three inches. On making pressure, the oil will run out to the amount of twenty-five per cent. of the mass. "The hard tallow, which I now call *strahein* [qu.] is taken from the cask, and put back into the kettle, with twenty pounds of soft water, four ounces cream tartar, and four ounces allum, which must be boiled and skimmed until clear. As this tallow is brittle, in order to give it the requisite elasticity, add one-eighth pound of bees-wax, to each pound of tallow."

Another method proposed is the following:—A clear ley is to be made from four pounds of pearl ash, and four of quick lime; this is to be put into a copper kettle, boiled, and stirred, for three hours "until it becomes a mush, by taking a little of which in a tumbler of cold water, it will dissolve like soap; this, when cold, is cleaned like first process, and pressed."

The foregoing is the conclusion of the specification, and it will be seen, therefore, that the patentee has not informed us how much of the foregoing processes he claims as new, nor does he appear to possess any correct knowledge of the nature of the operation which he describes; this latter circumstance, however, would be one of little importance as regards the validity of his patent, were his processes new and useful. The soap maker rarely understands the nature of the chemical changes which take place from the action of the alkalies on the fatty matter which he employs; but if he mixes his ingredients, and treats them correctly, his soap will be just as good as that made by a more scientific manipulator. The two processes are supposed by the patentee to produce analogous results, but in this point he is in error, nor will he by either of them obtain pure stearine, or the hard matter of fat; but this is not all, nor the point of highest importance; the materials which he will obtain will not make good candles, such as will give a clear light, and burn with a clean wick. It is foreign to our present object to enter into a scientific disquisition upon this point, the subject is one of much intricacy even to the well read chemist, and our business here is with practical results. We have before had occasion to notice the difficulty of getting rid of the alkali employed in decomposing fatty matters, as may be seen on turning to our notice of the patent of Mr. Lapham at p. 167 of vol. xii.; and in the latter of the above named processes no attempt is made to do so.

36. For a *Thrashing Machine;* Jehial F. Axtell, Geneva, Ontario county, New York, February 18.

It is unnecessary to describe this machine, as the thing claimed does not confine the invention, or discovery, to machines of any particular construction, but extends to all, past, present, and to come. "The improvement claimed is in making the sides of the machine of iron, instead of wood and other materials, and for the manner in which the same is put together," the said improvement being called "*Axtell's Cast Iron Thrashing Machine.*"

If we read the patent law, and the decisions under it aright, such a patent is of no value; there is neither invention or discovery in the thing; every body knows that the sides of such a machine might be made of cast iron, and that it might be put together by means of flanches and screw bolts. If this patent is good, so would another be for a machine in all respects similar, but cast of zinc, or any other metal, or metallic compound, than iron.—It is a mere change of material.

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37. For *Improvements in Milling;* Robert C. Stephen, Hackettstown, Warren county, New Jersey, February 18.

These improvements are said to consist in a mode of fixing mill stones, so as to admit cool air to the flour; and of creating a current of air to give the flour greater velocity in descending the spout.

In the first place, it is said that the stones must be dressed to suit the revolutions per minute, and that for one hundred and twenty revolutions, they must have six inches draft, in a four feet stone. The stones are to be divided into twenty equal divisions, having two long furrows to each division; in every other division, the furrow is to be an inch and a half wide, and three-quarters of an inch deep, terminating at the eye; inclined in depth and width from the circumference towards the centre, with fine feather edges. An opening, or eye, of ten inches, is left in the centre, to admit air and grain. In the upper stone there is a concavity, fifteen inches around the centre, and in the lower a convexity. The hoop enclosing the lower stone has a pipe placed in it, in the direction of the spout; this is closed on one side by a valve, and open next that of the spout, to produce a current of air to drive the flour down the spout with increased velocity.

The invention is said to consist "in the before described mode of drafting the stones, so as to cool the flour without the use of a hopper boy; and in the mode of introducing a current of air and forcing the flour down the spout, preventing its stopping, or clogging."

Should the foregoing account of this invention appear meagre, the fault is not ours, as we have given every thing which the specification contains. The drawings throw no light upon the subject, nothing more being shown in them than the faces of the stones, imperfectly represented; the spout, valve, and manner of creating a current of air, are all left to be guessed at.

38. For *Constructing and using Caissons for the Founding of Piers, &c.;* George Daniels, city of Philadelphia, February 28.

A scow is to be prepared sufficiently large to have, through its deck and bottom, an opening large enough to allow the caisson, when constructed, to pass through it. The scow is to be moored by means of guide anchors so as to allow it to rise and fall with the tide. In the drawing which accompanies the specification, the cover, or caisson, is represented of an oval form, and made of boiler iron, but we are told that it may be made in part of wood, and in part of metal. Piles are to be driven down through the openings in the scow, "and over them is to be let down, by proper tackle, the outside cover, or protector of the caisson," before spoken of. When the bed of the river is of mud, or stiff clay, to a considerable depth, the patentee presumes that no particular precaution will be necessary to prevent leakage; but when this is not the case, an apron of leather, or tarpaulin, is to be attached round the bottom of the caisson, so as to lie on the bottom where it is to be covered with stones and gravel. This apron, it is said, will render it unnecessary to sink the cover entirely to the bottom.

To raise the caisson, and the piles, when no longer required, the scrow is to be attached to them at low water mark, and the rising of the tide is to lift them by hydrostatic pressure.

The claim is to "the employment of a movable cover, to systems of pile or frame work, for the purposes before mentioned; and the dividing of the scow into parts for removing it clear of the work."

The patentee has not clearly explained what he intends by his caisson, protected by a cover; enough is given, however, to convince us that he will find it difficult, in most cases, to raise his piles and cover by the means indicated, and, more especially, to lift the latter over the piers, excepting in very small works. A tarpaulin, or leather apron, we do not think will prove very effective, when employed for the purpose, and in the manner, indicated.

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39. For improvements in the *Covering of Roofs with Tin or other metal;* John Hanson, Lexington, Rockbridge county, Virginia, February 28.

In a former number we described the mode of covering roofs with tin, invented by Prof. Charles Bonnycastle, of the University of Virginia; the present plan proposes certain improvements upon the former, and contains, also, a description of the tools employed in performing the work; the *models* are referred to for illustration, but no attempt is made to distinguish the points of improvement, or to tell to what extent the tools and other things described, are considered as new; this is to be regretted, as we believe the plan to be a good one, and understand that it has been fairly tested.

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40. For an improvement in the *Art of Boat Building;* George W. Eddy, Waterford, Saratoga county, New York, February 28.

The improvement consists in what the patentee calls *safety hulls.*

In a steam-boat he proposes to build the main hull three hundred feet in length, and about eighteen or twenty inches in width. On each side of this main hull is to be a *safety hull*, which may be of the same width with it; they are to curve round the bow so as to be of a good form, for passing through the water, and the same at the stern. Spaces within them are to be left for the paddle wheels, on each side of the main hull, or the wheels may be applied on the outside of the said safety hulls.

"Said hulls, or trunks, may be made cylindrical, or partake of the section of a cylinder, or of any other shape." "Now what I claim as my invention, and for which I ask a patent, is the principle above described." This is not a very clear manner of claiming a new mode of constructing boats, and time will show to whom belongs what, we suppose, is intended by "the principle."

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41. For a *Machine for Cutting Paper;* John Ames, Springfield, Massachusetts, February 28.

This apparatus is intended to cut machine paper into sheets of any required length, as it comes from the drying cylinders. The paper descends by its own gravity, and in doing so passes the edge of a standing knife, which extends across the frame for the purpose of aiding in the cutting. Below the standing knife a shaft crosses the frame, carrying two disks, or arms, to which another knife, called the revolving knife, is attached. This, as it passes round, comes into contact with the standing knife, and between these the paper is divided, as by a pair of shears, the revolving knife being so placed that it comes in contact with the standing knife at one end, whilst the other is at a distance of about three inches, thus cutting the paper successively along the whole width. As the paper is descending continuously, the sheet would be cut out of square, were not some provision made to prevent it; this is effected by means of a swing frame acted on by a cam, a bar across this frame coming in contact with the paper, and holding it at rest against the fixed knife during the moment of cutting, the cam then relieving it. The size of the sheet is regulated by that of the whirl on the shaft of the revolving knife, which can be changed at pleasure.

The claim is not to "the revolving knife, nor any of the parts of the above described machine separately, but to the several parts in combination, as above described, for the purpose aforesaid."

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42. For *Machinery for Cutting or Trimming Paper in the Ream;* John Ames, Springfield, Massachusetts, February 28.

Two upright cheeks are connected together by cross pieces, and between these cheeks is a sliding frame worked in grooves, and having a knife at its lower edge, which extends from cheek to cheek. The paper, in the ream, is to be confined in a suitable press, and its edges successively subjected to the action of the knife.

The patentee says, "I do not claim the knife, or the separate parts of said machine, or said press, as my invention and improvement is,

the combination of machinery in the manner above described, for the purposes aforesaid."

A claim of the above description is very good, where the combination is essentially new; but there is no magic in it, and it will not therefore change the character of, and give an exclusive right to, what is essentially old, which is the case with the machine before us. It has been many years before the public as a patented invention, and has been extensively used.

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43. For *a Bush and Spindle to a Grist Mill;* Jesse Barber, Phelps, Ontario county, New York, February 28.

The improvements here claimed consist in a mode of oiling the spindle and followers, without the trouble of removing the stone; and of tightening or loosening the followers around the spindle, at pleasure, by the mere turning of a screw or screws.

For the purpose of oiling, a tube, or pipe, projecting a short distance above the driver, descends through it, and passes into a hole in the shoulder, or neck of the spindle. A small hole is then bored from the outer side of the spindle, to meet the one into which the tube descends. Oil supplied to the tube is thus distributed around the spindle and followers, and enough may be contained in the tube to last for forty-eight hours.

The followers, which steady the spindle, are in the ordinary form; the wedges which are used to confine them in their places are made of wrought iron; they are lengthened out below, so as to form a screw bolt, and from the outer frame of the bush, of cast iron, a stirrup descends to the bottom of the bed stone, through a foot in which screw bolts, which are attached to the wedges, pass down, and by means of a nut on the lower end of each of these bolts, the wedges may be tightened or loosened at pleasure.

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44. For an improvement in *Water Wheels;* David H. Gilbert, Dorchester, Norfolk county, Massachusetts, February 28.

We have here again the reaction water wheel, which we have so frequently described, and differing but little from some of those previously noticed; and, in most of those cases where there is some apparent variations, the observation is made, that it is not necessary to make the parts spoken of in this form. The gates for closing the apertures of the buckets, although similar in the effect produced, by them, differ in their mode of action from those formerly noticed, but as there is nothing claimed but "the construction and use of such wheels as above described, and such cisterns within them, in connexion and combination with each other," we really do not know what it is intended to patent.

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45. For an improvement in the *Machine for Making Paper;* Joseph Truman, Bridgeport, Fayette county, Pennsylvania, February 28.

The patentee describes the construction of the cylinder machine

for making paper, and then observes, that from the manner in which the pulp is made to adhere to the revolving cylinder, there is a tendency in the fibres to arrange themselves in one direction, so as to give but little strength to the paper, which inconvenience it is the object of his invention to obviate. This he proposes to do by taking pieces of sheet copper, or other suitable material, and forming with them a sort of rack, by uniting them at one end to a cross bar, keeping them by this and other means, at a suitable distance from each other. These strips of metal are made concave at one edge, the curvature being adapted to that of the cylinder. This apparatus is to be placed within the vat, so that the concave edges will be nearly in contact with the cylinder, in consequence of which the pulp which passes to it must flow between these plates. A vibratory motion is given to the cross bar, and consequently to the pieces of metal attached to it; the sum of the distance through which the rack moves laterally, being equal to that of the motion of the cylinder in the same time. This apparatus thus becomes an agitator, and it is said that the paper is, by its means, rendered equally strong in all directions. "The agitating the pulp so as to completely intermix the fibres, equalize its consistence, and consequently strengthen the paper every way alike, I claim as my invention, though the specified means, and manner of doing it, may be varied *ad libitum.*"

A person unacquainted with the progress of invention in the art of paper making, would be led to conclude from the specification of this patent, that the agitator, for interlocking the fibres of the pulp was new in all its forms, whilst, the fact is, that although the evil complained of existed to a very considerable extent in the machine paper first made, it has been so far obviated by the agitators which have been invented, as to leave but little sensible difference in the strength of machine paper in either direction. Possibly the apparatus now patented may be superior to any other, but although specifically and clearly described, it is not claimed; but, instead of this, a broad claim is made to the agitating the pulp, so as to effect the desired object, by whatever means it may be accomplished, a claim which can never stand in law, as it is broader than the discovery, and, if admitted, would forestall all improvement.

SPECIFICATIONS OF AMERICAN PATENTS.

Description of a new Evaporating Furnace, and general process for accelerating the preparation of common salt by artificial heat; for the precipitation, incidentally, of colouring matters, deposited by the waters of the Western Salines; and for a method of consuming the smoke in said furnace; for which a patent was granted to JAMES COLQUHOUN, *Charleston, Kenawha county, Virginia, February* 6, 1834.

In constructing this furnace, parallel walls are to be built at the distance of five feet from each other, and extending twenty, thirty,

forty, or more feet in length. These walls are to be lined with fire brick, as, when enclosed at their ends, they form the body of the furnace. A series of circular arches is to be formed in these walls for the introduction of cylinders of cast iron, leading from the boilers on the outsides of the walls, into the interior of the furnace. The boilers, or evaporating vessels, are to be wooden cisterns, which may be fourteen feet long, seven wide, and five deep. From one side of each of these troughs, near their bottoms, project five hollow cylinders of cast iron, one end of which is open, the other closed; they are properly secured to the cisterns by iron flanches and screw bolts, at their open ends, the side of the cistern being perforated to receive them. The cylinders which have been used, are thirteen inches in diameter, and six and a half feet long; four and a half feet of their length being introduced through the wall into the furnace. There are similar perforations in each wall, as cisterns are to be placed along on each side of the furnace, the cylinders from one cistern passing into the spaces between those of the opposite cistern; or they may be so arranged as to be either above or below them; or so that lines uniting their centres may form a zigzag. The space occupied by the cylinders is to be covered by a flat pan.

These cisterns not being applicable to the process of crystallization, are only employed in evaporating until the liquid becomes nearly a saturated solution, when it is drawn off, at a boiling heat, into pans of sheet iron, or lead, for granulation by steam heat.

The granulating vessels, which, for convenience in manipulation, are five or six times as long as they are wide, are to be supported in a frame work, or trough, of wood, the floor of which is a little inclined, that it may carry off the water formed by condensed vapour; the flat bottoms of the pans are to be supported above this floor, by a sufficient number of plank placed edgewise, and the separate compartments thus formed are to communicate with each other, so that they may, in effect, form one steam space, or chamber. The pan must be so secured to the frame, or trough, by its sides, that steam may not escape between them. The steam from a boiler is to be conducted into the steam chamber through wooden tubes.

Some other modifications in the construction of the granulating apparatus, are contained in the specification, which, for brevity sake, we pass over.

Three cisterns are next spoken of, which are to be so arranged as to enable the manufacturer to make use of the steam not condensed under the granulating vessels, for the concentration of brine, in order that the heat contained in it may not be lost; the use of these cisterns is described, and in connexion with them there is to be a frame of wood twenty or thirty feet high, and strengthened by cross timbers in various parts. False bottoms, perforated with holes, hurdles, or other contrivances, are to be contained within it to distribute the brine which is to be raised and allowed to fall through them; in doing which it is to come into contact with various metallic tubes, heated by steam. As we are not aided in this part by drawings, the arrangement is not made very clear, nor does it appear that it has been fully

tested by the patentee, who says, in reference to the metallic tubes, "that they were first suggested to this applicant by way of experiment. Hence he incorporates them with this manufactural process, and claims the privilege of using them, as a part thereof, in the manner described."

The three cisterns, and their appendages last spoken of, are intended to aid in the precipitation of the colouring matter contained in the saline waters. It is said that there are held in solution, in the waters, sulphure ted hydrogen, carbonate, or supercarbonate of iron, and supercarbonate of lime; the first two of these, on decomposition, deposit colouring matter, to get rid of which, much labour and time are consumed in the ordinary process in the western works. Both the sulphuretted hydrogen, and the supercarbonate of iron, are, it is remarked, effectually decomposed in the process described by the patentee, and the arrangement of the cisterns is such that the precipitation of the colouring matter, goes on alternately in two of them, so that the contents of one are always ready to replenish the evaporating cistern.

The methods of consuming smoke, adopted in ordinary evaporating furnaces would not, it is believed, be applicable to one constructed like that used by the patentee. The mode proposed of effecting it in these furnaces, is the introduction of steam, through tubes, into the fore part of the furnace. The action in this case is hypothetically stated, and the effect appears to be rather a thing of inference, than the result of experience, and is neither distinctly presented or claimed.

The specification is manifestly drawn up by one possessing a due acquaintance with the chemistry of the operation, and is written with much general intelligence; still it is altogether defective as the foundation of a patent. In an instrument of this description there should not be any thing vague, or conjectural; nothing is secured which is not distinctly described, and altogether novel in its application or arrangement; in describing an apparatus, or process, it will, in general, happen that things which are not new, must be introduced to render the other parts intelligible, but when this is done, the applicant must carefully distinguish these things, and parts, from each other. He is to tell the public in what his invention consists, and the law expressly declares, that he shall do that in such full, clear, and exact terms, as to distinguish the same from all other things before known. There is undoubtedly enough of novelty in some parts of the apparatus and process described, upon which to have founded a legitimate claim, but this has not been done by the patentee.

Specification of a patent for an improved mode of manufacturing water proof boots, shoes, socks, &c. Granted to WILLIAM ATKINSON, *Tewkesbury, Middlesex county, Massachusetts, March* 8, 1834.

To all to whom these presents shall come, be it known, that I, William Atkinson, of Tewksbury, in the county of Middlesex, and state of Massachusetts, have invented a new and useful mode of man-

ufacturing water proof boots, shoes, socks, and overshoes, and other articles of similar character, and that the following is a full and exact description thereof.

The foundation of the boot, shoe, or sock, overshoe, is formed of wool, or tow, or a compound of wool and fur made into felt in the same way in which felting is effected in the manufacture of hats. To this material a suitable shape is given by being drawn over a last, or by other means.

I then take a varnish made by dissolving caoutchouc, or India rubber, in naptha, the essential oils, or any of the known solvents of that substance, with which I coat over the foundation of felt or cloth; upon this I lay a covering of cotton, or linen, cloth, or of any kind of cloth suitable to give firmness to the foundation, and to prevent stretching, and upon this I lay coats of the caoutchouc, either in the varnish, or otherwise prepared, and made perfectly black, or of any other colour, or left of the natural colour of the caoutchouc.

For the soles I attach leather, over which the varnish, or the caoutchouc in sheets, may be applied. This method prevents sharp, or other, substances, cutting through the boot, and gives security and firmness to the sole of the foot, perfectly covering the leather, or canvass, which may be used at the side and bottom. The sheets may be applied by softening the surfaces to be attached with the spirits of turpentine, or any of the solvents, so as to make it tacky. Let them get nearly dry before attaching, and much time will be saved and the fabric will more quickly become firm.

The heel may be stiffened by cloth, leather, or other material; and the lifts of the heels formed by attaching leather together by the caoutchouc in the nearly dry state of the varnish; or they may be made of the caoutchouc entirely, and attached as before mentioned and described. When boots are formed, I cause the webbing, or leather, of which the straps are made, to pass down the leg of the boot, and reach nearly to the bottom, in order to obviate the stretching of the material of which the boot is formed.

What I claim as my invention is, the application of woollen felt, of wool and fur, or other cloths, or a combination of wool and fur, to the formation of boots, shoes, socks, or overshoes, and articles of similar character, and the covering the same with caoutchouc or India rubber, in the manner, and for the purposes herein set forth.

WILLIAM ATKINSON.

Specification of a patent for an improvement in the construction of Steam-boats and other vessels. Granted to HENRY BURDEN, *city of Troy, Rensselaer county, New York, March* 8, 1834.

To all whom it may concern, be it known, that I, Henry Burden, of the city of Troy, in the county of Rensselaer, and state of New York, have invented a new and useful improvement in the method of constructing steam-boats, and other vessels, whereby they are ren-

dered capable of being propelled with greater velocity by the application of a given power, than any of those which have heretofore been constructed; and I do hereby declare that the following is a full and exact description of my said invention.

It is an ascertained fact, that in order to lessen the resistance opposed to a solid body in its passage through a fluid, all that is necessary is to decrease it in its transverse section, and to give to it a proportionate elongation, and a proper curvature. It has not, however, been found practicable to carry this to a much greater extent than has already been done, whilst the hulls of vessels are constructed upon the plan of building ordinarily pursued. To take advantage of this principle, and to avoid the difficulties hitherto experienced in the attempt to do so, is the object of my invention, which I carry into effect in the following manner.

I construct two, or any convenient number of barrel-formed floats, of great length in comparison with their diameter; these I prefer to make perfectly round in their cross section, tapering them from the middle towards each end, but leaving them curved longitudinally in the manner of a barrel, and carrying them to a point or nearly so at each end. These floats I form of staves throughout the greater part of their length, or until the interior diameter of the float becomes so small that it will merely admit a man to tighten the staves, the remainder thereof being of solid timber.

When two such floats are used, I place them at such distance apart as to admit of the revolving of the propelling wheel between them; a suitable number of beams pass from one float to the other, to connect them together; which beams are hollowed at each end so as to fit the curvature of the floats, and are fastened to them in a way to be presently described. Upon these beams the superstructure, containing the cabin, machinery, &c. is sustained.

The staves of which the floats are made, must, in thickness, and in other respects, be proportioned to the size of the vessel. When the floats are of such a length that timber cannot be obtained sufficiently long to make the staves in one piece, I use two or more lengths, joining the ends by tongues and grooves, and taking care to break joints so as not sensibly to lessen the strength.

As it is of vast importance that these staves should be forced together so as to be water tight without depending upon caulking, and that they may be drawn together at any time, without encumbering the surface of the float by hoops, or any similar contrivance, which, at the best, would answer the purpose very imperfectly; I make hoops, or rings, either of cast or of wrought iron, the outer diameter of which must be less than that of the interior of the float, in the parts where they are to be placed, and their interior diameters such as that a man can conveniently pass through and tighten the nuts which bear against them. Through each of these rings there are as many holes as there are staves to be drawn together. A bolt passes into them through each stave, its head resting thereon, being made sufficiently large, or having a suitable washer, or plate, under it to prevent its drawing through the timber. The inner end of each

of these bolts is tapped, and furnished with a nut, by means of which the staves may be drawn towards the outward periphery of the hoop with any desired degree of force. There must be such a number of these rings, or hoops, as may be found necessary to render the staves perfectly tight; a point to be experimentally decided: I, however, esteem a distance between them of five feet to be such as will in general answer the purpose perfectly.

The beams, or timbers, which connect the floats, are to be bolted thereon, there being solid blocks within the floats for the bolt heads, or nuts, to bear against; the hollowing of the lower sides of these timbers forming a sort of saddle, by which they fit to and span over the top of each float.

The length and diameter of the floats, the thickness of the timber employed therein, and the particular size and strength of the other parts, will depend upon the dimensions of the general structure, and the load to be carried, and may, in great part, be calculated upon known principles, although they must also, in part, be determined by experience. Without intending to confine myself in these particulars, I will here give the proportions that I have adopted in a boat which I have built upon the foregoing plan.

The floats are three hundred feet in length, and eight feet in diameter at the centre; the number of staves is twenty six, and their thickness three inches and a half.

Although I propose to give to the floats a round form, the principle upon which they are constructed will admit of their being varied in this particular, requiring only that degree of curvature in their section which will admit of their parts being drawn together by an internal apparatus of bolts and screws, so as to form perfectly close joints. As, however, the quantity of timber, in proportion to their capacity, the equal tension of the parts, and other important points, will be best attained by a circular form, I give to this the preference.

The drawings which are deposited in the Patent Office, with the written references thereunto annexed, will serve fully to illustrate the various points to which allusion has herein been made.

What I claim as my invention is, the using of two or any other number of floats, constructed upon the principles herein set forth, made of such size that they shall, from their buoyancy, sustain the superstructure and load, answering in this respect the purposes of the hull of an ordinary vessel, for which they are substituted, but offering a much less resistance in their passage through the water. I also claim the within described mode of drawing the staves, or separate pieces of such floats together, by means of internal hoops and screws operating upon the principle set forth; not intending to confine myself precisely to the mode of forming or putting together the various parts, as given in this specification, but to vary the same in any manner which I may find convenient, and which is in conformity with the general principle of procedure, and which produces analogous results.

HENRY BURDEN.

Specification of a patent for an improved process for manufacturing Tea Pots, and other articles of Brittania Ware. Granted to WILLIAM W. CROSSMAN, *Taunton, Bristol county, Massachusetts, March* 12, 1834.

To all to whom these presents shall come, be it known, that I, William W. Crossman, of Taunton, in the county of Bristol, and state of Massachusetts, have invented a new and improved process in the manufacturing of tea pots, coffee pots, sugar dishes, cream jugs, and other articles, which are capable of being formed in the lathe, and are made of that kind of metal, alloy, or mixture of metals, of which those vessels are constructed, which are denominated Brittania ware, or any other similar metal, or mixture of metals, capable of being so wrought; and I do hereby declare that the following is a full and exact description of the said process.

The ordinary mode pursued in making such ware is to raise, or stamp up, from the sheet metal, such parts, say one-half, of these vessels, as will relieve from the mould or die after stamping, and then to solder such parts together. By the process which I have adopted, I rub, or burnish up, the required vessels, from a single flat plate, or sheet. Thus, suppose it is intended to form a tea pot, the middle part of which is intended to be bulging, or bellied; I fix in the common turning lathe a chuck, the outer end of which I turn into the form intended to be given to the lower half of the tea pot, leaving the inner end, which is fixed to the mandrel of the lathe, cylindrical. I then take the circular plate of metal and place it centrically against the outer end of the chuck, and against this, a flat piece of wood, against which the front centre of the lathe is to be brought up, so as to keep the metal in its place, and to allow it to revolve with the lathe. When put into rapid motion, I bear against the metallic plate with a soft piece of wood, or other suitable substance, so as to turn it over into the chuck, by which means the lower half is formed. In order to finish its upper part, I fix the lower end in a hollow, or female chuck, and by bearing against the upper end with a soft piece of wood, I give to it such form as I desire, which I can readily do by steadying the piece of wood on the rest. It is not necessary, in this case, that there should be any solid substance within the part of the pot to be so formed. But should this be in any case desired, such a piece may be very readily placed there, passing it in at the open end of the pot, like the end of the T of a rest, and sustaining it in a similar manner, where the metal may be brought up to it by the pressure of the piece of wood on the outside.

I have thus fully described the manipulation in such a way as will enable any competent workman to follow it without difficulty, and to produce any of the forms required in such ware, or vessels, to which the latter is adapted. When it is desired, beads, rims, or edges, may be afterwards added to vessels so formed, so as to meet the require-

ments of taste, or fashion; but in doing this, there is nothing peculiar in the mode of procedure.

What I claim as my invention, and for which I ask a patent, is the forming of the bodies of tea pots, coffee pots and other articles, of Brittania or other metallic ware, or vessels from one piece of any metal capable of being so wrought, without the necessity for soldering seams, by taking flat plates of metal, and giving to them the required shape in the lathe, whether the same be done precisely in the manner herein described, or in any other dependent upon the same principle, and producing a similar effect.

WILLIAM W. CROSSMAN.

Specification of a patent for a Machine for Shelling Corn, &c. Granted to CALVIN PAGE, *Sandbornton, Strafford county, New Hampshire, March* 13, 1834.

To all to whom these presents shall come, be it known, that I, Calvin Page, of Sandbornton, in the county of Strafford, and state of New Hampshire, have invented a new and useful machine for shelling corn, to which machine I attach also a winnowing apparatus, by which it is cleaned at the same operation; and I do hereby declare that the following is a full and exact description thereof.

The frame of the machine may be varied in its form, but that represented in the drawing thereof deposited in the patent office, I have found to be a convenient one. The shelling is effected between a cylinder and a vertical rack, or grating, which is made movable, so that it can be pressed closer to, or made to recede from, the cylinder, as may be required. The diameter and length of the cylinder, as well as the size of the other parts of the machine, are to be varied according to the power to be applied to it. The cylinder may be made of wood, and in a small machine may be a foot in diameter, and two feet in length. Upon this cylinder iron beaters or shellers are to be placed, which may consist of bars, or rods, of iron, half an inch in width, and a quarter of an inch in thickness; these are to pass spirally from end to end of the cylinder, their inclination may be such as to carry each of them about one-third of the way round the cylinder; of these there may be eight, or any other convenient number, firmly attached, so as to stand out their whole thickness from the surface of the cylinder. Motion may be given to this by means of a cog wheel acting upon a pinion on one end of an iron shaft upon which it revolves. The cylinder will answer well when standing horizontally, but it may be a little inclined towards the end from which the cobs are to escape; the spiral form of the beaters, however, may be made to force them out without this inclination.

In front of the cylinder, and extending along it from end to end, is a bar of iron, or a strip of wood faced with iron, upon which the ears of corn rest, and revolve, as they are shelled by the action of the beaters. This stands about level with the axis of the cylinder, and may be supported in its place in any convenient way. The corn is

pressed against the cylinder by the vertical rack or grating, before named. This consists of vertical slats, attached at each end to a cross piece, by which they are framed together. The lower cross piece works upon pivots, or hinges, being situated below the rest which sustains the corn, usually as low down as the under side of the cylinder. The faces of these slots should be covered with sheet iron to prevent their wearing. Against the back of this rack, and near its upper edge, two, three, or more, springs are made to press, and these may be regulated by screws bearing against them, causing the rack to approach towards, or recede from, the cylinder.

The whole machine is covered with a close case, surmounted by a hopper, or feed hole, through which the corn to be shelled falls between the cylinder and the rack; from thence the grains pass directly down, or between the slats, on to a shoe or sloping bottom, where there is a fan, or winnowing mill, operating in the ordinary way. The shaft of the fan wheel may be turned by a band from a whirl on the axis of the cylinder opposite to that on which the pinion is placed. The casing entirely prevents all scattering of the corn, whilst there are suitable doors, or shutters in it, which may be opened to inspect the work, and regulate the machine.

At that end of the rest towards which the curvature of the beaters carries the corn, there is an opening left for the escape of the cobs, which thus fall outside of the machine; the hopper, or feed hole, being at the opposite end, to insure its being completely shelled before it passes out.

I do not claim as my invention any of the parts of this machine, taken separately, nor do I claim the performing of the operation of shelling and cleaning simultaneously, this having been before effected; but what I do claim is the general construction and arrangement of the shelling part, consisting of the cylinder with its spiral beaters, the rest, and the vertical rack, constructed in the manner, and operating upon the principle hereinbefore set forth; without regard however, to any particular dimension, or materials, or to the precise form given to the respective parts.

CALVIN PAGE.

Description of "an improvement in Stoves for Burning Anthracite or other Fuel." Patented by ABRAHAM E. SPOOR, *Coxsackie, Greene county, New York, March* 15, 1834.

The form of the stove esteemed the best by the patentee, is that of a cubical box. It has two openings in front, one for the ash pit drawer, and the other a door for the supply of fuel, about nine inches above the former. The door is to be an open frame containing mica, and its lower edge is to be level with the top of the fire, so that its whole surface may be exposed to view. Another opening is to be made either in the front or back, upon a level with the grate, for the purpose

of introducing a shaker, to remove the ashes; a longitudinal stopper is made to close this opening very perfectly.

On each side of the ash drawer are two vertical plates, leading from front to back, and dividing this lower part of the stove into three compartments, the two exterior of which are to form a portion of the flues. These plates sustain a horizontal one, which has the circular grate in its centre; this horizontal plate has its four corners removed to make openings into the compartments on each side of the ash drawer. The circular grate is detached from the horizontal plate upon which it rests, and is capable of being vibrated circularly, or of being tilted to discharge the fuel, when moved round to a certain point.

The holes in the corners of the lower plate are surrounded by vertical plates forming them into four flues; the two in front may extend two or three inches only above the top of the furnace, but the two in the rear are extended up to a sloping back, or to the top plate of the stove, and be surmounted by pipes. At about nine inches above the horizontal plate is a second, similar to it, with a round hole in its centre; this forms the top of the furnace, the space between the two plates being filled with fire brick. Above the furnace there is a sloping back plate cutting off a triangular prism at the back of the stove, and forming a chamber into which the rear flues may enter, and from which the smoke pipe of the stove leads.

The patentee claims as improvements, "the grate above described, with the mechanism for supporting it, and also the enclosed avenue for the shakers." "The internal revolving flues within the body of the stove, by which the heated air directly from the glowing mass of burning coal, in its revolution, first downward, then backward, and upwards, is brought in contact with nearly the whole internal surface of the outside plates of the stove, imparting heat to the room, and furnishing an opportunity for warming the feet." "Another improvement relates to the form of the burning mass; it is founded on the fact that anthracite does not burn so well in a square, or angular, as in a cylindrical form; and that when a mass of coal over nine inches in height becomes all ignited at once, so many ashes are formed and diffused through the mass, that it is impossible to separate the ashes effectually from the coal, without introducing the poker, and stirring it up from the bottom." "The mass of coal should be in the form of a cylinder, and in no case, whatever be the size of the stove, exceed in height eight, or at most, nine inches." "I claim as an improvement the location of the transparent door, at such an elevation as to expose the whole surface of the fire to full view."

The validity of the last claim we are constrained to doubt, as the location spoken of is that of cylindrical stoves for anthracite, in general; its location is not new, therefore, nor is it pretended that the door itself is so. Can the patentee prevent me from putting a transparent door, an old contrivance, on to a stove which I have had in use for years, in the place of the old door; we rather think not. The improvement in this stove which "relates to the form of the burning mass," is not absolutely claimed, nor do we perceive with what propri-

ety it can be alluded to as appertaining any more to this stove than to thousands of others which have been in use ever since the general introduction of anthracite. The patentee will find but few in which it has been attempted to exceed the height of nine inches in the burning column. The arrangement of the flues appears to be good, and sufficiently distinct to sustain the claim made to this particular construction.

Specification of a patent for a Machine for Dressing Staves for Barrels. Granted to SOLOMON CRUMBER, *Hemlock Township, Columbia county, Pennsylvania, March* 18, 1834.

To all whom it may concern, be it known, that I, Solomon Crumber, of Hemlock Township, in the county of Columbia, and state of Pennsylvania, have invented a new and useful machine for dressing staves for barrels, and that the following is a full and exact description thereof.

I prepare two strong knives, or cutters, which I place parallel to each other, and at such distance apart as shall be equal to the thickness of the stave to be dressed. These knives are made flat on their inner sides, and are capable of being so adjusted as to change the distance which they stand apart. Between these knives the staves are to be forced by means of a follower, or driver, having teeth upon it into which a pinion works. The machine is easily moved by hand, it being so geared as to require but little power to turn it by means of a crank. The proportions of the gearing may vary, but I have adopted the following in a machine which I have at work.

The wheel on the crank shaft is thirteen inches in diameter, and this takes into one of six feet in diameter; upon the axis of this sesond wheel there is a pinion of five inches in diameter, which takes into the teeth of the follower, or driver. This latter works up and down between suitable guides, and must be of such length as will adapt it to that of the staves to be dressed.

As the staves are sometimes winding, and require the application of force to direct them in passing between the knives, I employ an apparatus for that purpose which is constructed in the following manner. A platform, or horizontal table, extends on each side of the knife edges, and upon this I place two twisted pieces, or guiders, one to the right, and the other to the left of the knives, the edges of which may be forced up against the stave, on either side, and be made to bear more or less towards one edge or the other, as may be necessary to give a cant to it. These pieces are to be forced up by levers which are of the second kind, and lie loosely on the table. They are attached to the back ends of the twisting pieces by a joint and pin, and their extreme ends, which are their fulcra, rest and bear against a ledge, but not being held by a pin they can be slid along so as to change the point of bearing. In each of the twisting pieces there is a longitudinal slot, or mortise, which passes over a pin on the table,

by which means their edges are canted when the levers are either drawn forward, or pushed back; to prevent friction, the bearing edges of each twisting piece is formed by a roller. For an exemplification of this arrangement I refer to the drawing deposited in the Patent Office.

What I claim as my invention is the general arrangement of the before described machine; with the adjustable knives between which the staves are forced in the manner set forth; and furnished with the apparatus for canting the stave, so as to take it out of twist; whether the same be made in the form and manner herein shown, or in any other in which its principle of operation is similar.

SOLOMON CRUMBER.

Specification of a patent for an improvement in the application of Valves to Steam Engines. Granted to JOHN KIRKPATRICK, *city of Baltimore July* —, 1834.

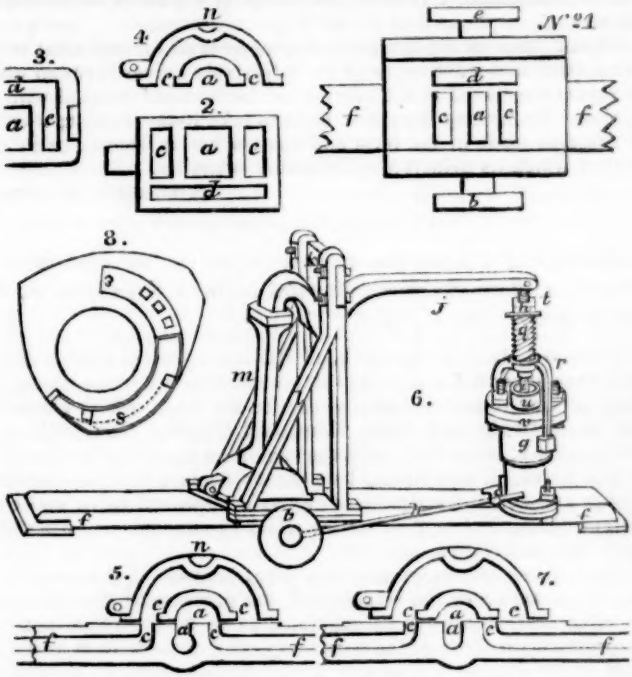
Whereas I, John Kirkpatrick, of Baltimore, in the state of Maryland, have invented a new and improved slide valve for steam engines, with an improved cam suitable to the same, which I denominate the *Self-balancing Slide Valve, and Shifting Cam;* now be it known, that in conformity with the requirements of the law granting patents for useful inventions, I do hereby declare that the following is a full and exact description of my said improved valve and cam, reference being had to the drawing which accompanies, and makes a part of this description.

I denominate this valve self-balancing, because it is so regulated that by the action of the steam itself, the pressure of the slide upon the valve seat, is always so regulated as to be the same, however much the elastic force of the steam may vary in the boilers, and other parts of the engine. The cam I denominate shifting, because by shifting a circular plate attached to it, backward or forward, the steam is cut off earlier or later in the stroke, which is often required by changes of fuel, or resistance of the engine.

In some respects, this valve and cam, but more especially the latter, are similar to others now in use, and to such parts which are so, I, of course, make no claim; but, besides the self-balancing apparatus, to be presently described, there are some points in the arrangement of the steam ways, in the valve, and valve seat, which are new and which I consider as improvements.

No. 1, in the accompanying drawing, represents a valve seat, placed upon the ordinary side pipe of an engine, and shown in what I esteem the proper proportions for an eccentric motion. No. 2 represents the face of the slide which is adapted to No. 1. No. 3 is a section through the middle of the slide in a transverse direction, and vertical to its face. No. 4 is a similar section, longitudinally. No. 5 shows a similar section of the valve, its seat, and a portion of the side pipe. No. 6 is a perspective view of the whole self-balancing valve, and its appendages, excepting the cam. No. 7 is a modifica-

tion of the valve and seat, to shut off at any part of the stroke which may be determined upon. No. 8 is a shifting cam suitable for No. 7, the shifting projection plate being set at half stroke.



In No. 1 the opening *a* is for the admission of steam into the cylinder, through the steam pipe *b*. The two parallel openings *c c* are for the alternate admission and escape of steam to and from the two ends of the cylinder, being conducted into them through the cavity in the valve *a*, and from them in the slide, by the passages in the valve *c c*, to the longitudinal cavity *d*, thence to the longitudinal passage in the seat *d*, thence out through the escape pipe *e*. The corresponding openings in the valve and seat, are designated by the same letters. The openings *a c c* of the seat, are all of the same dimensions. The opening *d* is of the same width with them, and in length equal to the width of the three, and the spaces between them.

In the valve No. 2, the centre opening, or cavity, *a*, which may be denominated the steam chest, must be sufficiently wide to embrace the centre opening *a*, and one of the end openings, *c*, of the seat. In sliding, therefore, by means of a cam or eccentric motion, the steam will be alternately admitted into, and discharged from, each end of the cylinder *f f*, through the different openings of the valve and seat.

For shutting off at half stroke, or at any other desired point, the

construction of the valve is the same as that already described, but there is a difference in the proportion of the openings and spaces. In No. 7, the middle opening of the seat is of double the width of the two end ones *c c*. The spaces between them are of the same width with the middle opening, and the cavity *e* of the valve, or steam chest, extends from the centre of the middle opening to the extreme edge of either of the end openings, or the centre opening of the seat may be rather less than twice the width of one of the end openings, and the spaces rather less than that: the proportions of the valve will of course vary with that of the seat. Every competent engineer will readily perceive the effect of this arrangement, and how it may be varied and adapted to shut off at any desired part of the stroke, by moving backward, or forward, the circular plate S, of the shifting cam No. 8. The dotted line shows the form of the cam when the plate is shifted on to *w*.

In No. 6, *b* is the steam pipe, and *g* is a cylinder, or chamber, for containing a piston, or plunger, into the lower end of which cylinder steam is admitted through the tube *h*. The piston rod *i*, extends up to, and is connected with, the lever *j*, which has a knife edge or circular fulcrum under the cross piece *k* of the frame *l*. The stem *m*, has a cavity in the upper end to receive the end of the lever; and there is a similar cavity *n*, in the valve, to receive the lower end of the stem. This mode of forming the joints, although not essential to the general plan, is extremely convenient, as it affords ample bearings, which may be made to move in oil; it also allows the valve to be taken away, without the trouble of turning a screw, and replaced in the same manner. The size of the plunger, or piston, in *g*, must be such as shall produce the self-balancing effect, operating by means of the lever upon the valve; in making this calculation, the area of one of the end openings of the seat, added to the area of the steam chest, or cavity of the valve, is the area of the plunger, or piston, with a lever of equal length at both ends; but as the end of the lever next the plunger will be longer than that next to the valve, so, inversely, will the area of the plunger be less than the area of the steam chest, and one of the end openings.

The nut *p* upon the piston rod acts upon the spiral spring *q*, which has its lower bearing upon the bow *r*, and by means of this, the degree of friction may be regulated. On the inside of the spiral spring *q*, is a cylinder with a flanch *t*, directly below the nut *p*; this cylinder is to protect the screw on the upper part of the piston rod *i*; the lower end of the cylinder passes through the upper part of the bow *r*; the lower end of the piston rod terminates at the bottom of the hollow of the plunger *u*, which should be about the centre of the shifting box *v*; the vibration is thus taken from the plunger, while the other parts connected with the lever conform freely to its action.

What I claim as my invention is the general form of the valve, and its appurtenances, as herein described, by means of which the self-balancing principle is applied, the elastic force of the steam acting upon a piston, being thereby made to react upon the valve with any desired degree of force; also the application of a shifting projection

to the cam (for purposes already described,) which combines in a single cam, the means of shutting off at any part of the stroke, with the principal motion of the valve. And I do hereby declare that I do not intend to confine myself to the precise arrangement herein shown, but to vary the same in any mannnr which I may deem proper, whilst the same principle is applied, and a similar effect produced.

JOHN KIRKPATRICK.

ENGLISH PATENTS.

Specification of the patent granted to CHARLES T. MILLER, *for certain Improvements in making or Manufacturing of Candles. Sealed February* 14, 1830.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said Charles T. Miller, do hereby describe and ascertain the nature of my said invention, and the manner in which the same is to be performed, by the following description thereof, that is to say:—

My invention relates to wax, spermaceti, and composition candles, and consists of a glass ring, being introduced round the wick at the neck of each candle, thereby forming a fence round the wick.

In the manufacture of wax candles, I introduce the ring by passing it over the top, and putting it on the neck of the candle at the half-making, and in other respects these candles are to be made in the usual manner.

With respect to the spermaceti and composition candles, the mode of introducing the ring is as follows: I cotton the frames in which the candles are made in the usual manner. I then put a ring round each wick at the top part of the frames; that is, at the part which forms the bottoms of the candles. When the frames are turned down, the rings fall to the bottoms of the pipes, that is, to the parts which form the tops of the candles, and when the melted ingredient is poured in, the ring will be properly fixed in the neck of the candle.

In the spermaceti and composition candles I use the platted wicks, which are now in general use, but I do not claim this kind of wick as my invention.

No. 1. *No.* 2. *No.* 3.

The rings which I use are made of solid round glass, and I use three sizes, designated as above by the numbers 1, 2, 3. No. 1, the largest, I use for short twos. No. 2, for long twos and short threes,

and for all candles of the same thickness; and No. 3 for all candles not so thick as short threes.

Rep. Pat. Inv.

Specification of the patent granted to GEORGE FREDERICK MUNTZ, *for an improved manufacture of Boilers used for the purpose of Generating Steam. Sealed October* 8, 1833.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said George Frederick Muntz, do hereby declare the nature of my said invention to consist in the application to the manufacture of steam boilers, of a certain alloy of copper and zinc, the nature of which is set forth and described in the specifications of two certain patents granted to me, the said George Frederick Muntz, the one bearing date at Westminster, the 22nd day of October, 1832, entitled "An improved manufacture of metal plates, for sheathing the bottoms of ships, or other such vessels;"* the other also bearing date at Westminster, the 17th day of December, 1832, entitled "An improved manufacture of bolts, and other, the like, ship's fastenings;"† specifications of which said two last mentioned patents were duly enrolled in his said Majesty's high court of chancery, within the time limited for that purpose, reference being had thereto respectively will more fully appear; and which said specifications contain the following description of the said alloy, that is to say:—

"The said alloy is composed of copper and zinc of the following qualities and proportions, that is to say,—I take fine copper, called best selected copper, and good zinc, and melt them together in the usual way, in any proportions between fifty parts of copper to fifty parts of zinc, and sixty-three parts of copper to thirty-seven parts of zinc, both of which extremes, and all intermediate proportions, will work at a red heat, but I prefer, in all cases, the alloy to consist of about sixty parts of copper to forty parts of zinc. This compound I cast into ingots of any convenient weight, and then heat them to a red heat and roll them into sheets, or hammer, or otherwise work them into bolts, in the same manner as copper is rolled and worked, only taking care not to overheat the metal so as to produce fusion, and not to put it through the rollers, or hammer, or work it after the heat has left it too much, say when the red heat goes off."

Now whereas it is evident that the said alloy may also be made from a compound of copper and calamine, by cementation, taking care that the quantity of calamine shall be such that the zinc extracted from it will be in some of the same proportions to the copper as before mentioned, but as it is very difficult to make the copper take up the necessary quantity of zinc by this process, it is more expensive. It is equally evident, that brass of very good quality, with the

* For an account of this patent, see Jour. Frank. Inst. vol. xii. p. 195.
† For specification of this patent, see „ „ „ vol. xiii. p. 45.

addition of zinc requisite to make the proper proportions of copper and zinc, will likewise work and roll hot, and answer the purpose, but is again a more expensive mode. I therefore prefer and adopt the process hereinbefore first described for making the said alloy.

Now whereas the said alloy may be made into rivets as well as bolts, or drawn into pipes, both which may be necessary for the purpose of making steam engine boilers; and I claim as my invention the application of the said alloy to the manufacture of boilers used for the purpose of generating steam for steam boilers manufactured out of the said alloy, whereby they may be made more light, durable, and cheap than where copper is used. [*Ibid.*

To LOUIS QUETIN, *for an invention of a new or improved vehicle, or combination of vehicles, for the carriage or conveyance of passengers, and also luggage and goods, constructed upon a principle of security against overturning or upsetting, and possessing other advantages which he conceives will be of public utility. Sealed July* 25, 1829.

This is an extraordinary project for obtaining safety, and preventing a carriage from overturning, consisting of a plan for running the carriage upon a single wheel.

A broad wheel, or rather a bowl-shaped roller, is provided with an elongated axle extending at both ends. To this axle a strong rectangular horizontal frame is attached, with uprights, called a cage, circumscribing the wheel on which carriage bodies, with suitable boxes, or boots, are fixed by the sides of the wheel, before and behind it, and also on the top. These carriage bodies and boots are to be so exactly balanced, that the whole weight may be supported and poised upon the wheel, or roller, in the centre.

The construction of such a ponderous vehicle may be readily conceived. The frame work, or cage, that is to circumscribe the central wheel, must be made exceedingly strong in order to support the carriage bodies, which may be formed agreeable to the taste of the builder, or in the usual appearance of carriage bodies suited to receive passengers, having capacious boxes, or boots, as magazines beneath for the stowage of heavy goods and luggage. On the tops of these carriage bodies cabriolas are to be placed for outside passengers; and the whole, that is, the carriage bodies, boots, or magazines, and cabriolas, are to be so mounted upon springs connected with the frame-work, or cage, that any concussions caused by passing over obstructions on the road may be neutralized.

As the vehicle may be subjected to some vibratory or swinging action in its travelling upon roads, there are to be anti-friction rollers attached under the carriage magazines, or boots, at the sides, which come in contact with the ground in case of any preponderance of either side of the vehicle, allowing the carriage to roll on without obstruction.

The vehicle is to be drawn by horses, as other carriages, having a pole in front; and we presume that the bowl shape of the wheel will allow of its turning, without much difficulty, to the right or left, out of the straight course.

A variation of this scheme is also described, but the precise construction of which we do not exactly perceive. It is proposed that a broad wheel of large diameter without spokes should be employed, within which a carriage body is to be suspended by some means which are not intelligibly explained. We presume that the carriage body is to hang upon gimbles, or universal joints, within the wheel, as it is stated that its erect position is to be preserved by weighting the under part of the carriage body, which, as the wheel goes round, will preserve its position by means of its gravity.

[*Lond. Jour.*

ON THE MANUFACTURE OF VARNISHES.

(Continued from p. 140.)

On the Choice of Linseed Oil.

The choice of linseed oil is of peculiar consequence to the varnish maker, as upon its quality, to a great extent, depends the beauty and durability of the varnish. Oil expressed from green, unripe seed, always abounds with watery, pulpy, acidulous particles. The quality of oil may be determined in the following manner:—Fill a phial with oil, and hold it up to the light; if bad, it will appear opaque, turbid, and thick; its taste is acid and bitter upon the tongue, and it smells rancid and strong: this ought to be rejected. Oil from fine, full grown, ripe seed, when viewed in a phial, will appear limpid, pale, and brilliant; it is mellow and sweet to the taste, has very little smell, is specifically lighter than impure oil, and when clarified dries quickly and firmly, and does not materially change the colour of the varnish when made, but appears limpid and brilliant.

On Essential Oil, or Spirits of Turpentine.

That which is used for mixing varnish ought to be procured and chosen as pure, strong, and free from acid as possible. Some turpentine being drawn from green trees abounds with a pyroligneous acid, which rises and comes over with the spirit in distillation; it is strong and bitter to the taste, and appears milky, particularly towards the bottom, after standing to settle. Therefore, the longer turpentine is kept before it is used, the purer and freer it will be from acid at the top of the cistern, as all its impurities will fall to the bottom, and will be found unfit for any purpose in making varnish.

On the Choice of Dryers used in Varnishes.

The dryers hitherto used in the making of varnishes have been used either without care or judgment, in the most injurious manner, it being the common practice to introduce great quantities of red lead,

common litharge, sugar of lead, and foreign white copperas, raw Turkey amber, &c., without either considering the proper quality or quantity, which have had the most injurious effects on the delicate colours upon which varnishes so made, (or rather so spoiled,) have been applied.

Sugar of lead, when bought for the purpose of adding to varnish as a drier, ought to be that which has been made from white lead, and not that which has been made from litharge, that from white lead being the finest, and in its particles purer and transparent. All sugar of lead contains about 14.2 per cent. of the water of crystallization, so that to use it in that state is very injurious to the varnish, as its water prevents that complete union of the particles of gum, oil, and lead, which ought to combine instantly and form a whole; therefore it is necessary to bruise the sugar of lead into powder, and lay it upon cartridge paper over a warm drying stove, and keep turning it and moving it about, to prevent its running into a mass, until it gradually dries; it will then feel quite fine and soft, resembling hair powder: afterwards sift it through a forty mesh sieve; it is then fit for dryers. Keep it closed up in a dry stone jar until used, otherwise it will absorb moisture from the air.

White Copperas, or Sulphate of Zinc.—The foreign article of this name is chiefly imported from Germany, is that which is generally used as a drier for varnishes, and in its undried state is more objectionable than the sugar of lead, because it both discolours the varnish and injures the oil, by affecting both its elasticity and durability.—Another objection to its use in this state is, that it requires the varnish to be kept for many months to settle; and if the varnish is not made very thin, it will never get clear of the zinc near the bottom of the cistern. It is, therefore, necessary to bruise and dry it exactly as before directed for the sugar of lead. Sift and keep it from the air until the time it is wanted for use. This is the strongest and most effective drier when carefully dried and sifted, because it is then entirely freed from its watery particles. From its astringent quality, it immediately seizes on any aqueous particles, whether from the oil, gum, or turpentine, if a sufficient quantity is used. Such is its astringent and absorbant quality, that if even water were mixed with the varnish, the copperas would sieze upon, and carry it down to the bottom; neither will it ever combine with the oil as calces of lead do.

Litharge is to be chosen as free from extraneous earthy matter as possible: that which is from the richest and softest lead is the best, and is termed "wind-blown," or WB; it is in large broad flakes, or scales, appears very bright, skins, and feels soft between the finger and thumb when rubbed; whereas the bad quality is distinguishable by an opaque, dull, or earthy appearance, and feels hard and gritty to the touch, and is very full of extraneous matters: this ought always to be rejected, as also all ground litharge; for it is easy to conceive the injury a mixture of impure lead, iron, and impure earthy matters, would occasion if introduced into varnish.

Red Lead, like litharge, ought to be chosen as free from earthy and extraneous matter as possible. A great quantity of red lead is adul-

terated with earths, ochres, &c., therefore procure that which is most pure: it is known from its strong, clear, bright colour, by its weight, or, if worth while, it may be easily analysed. The best red lead is a strong and efficient drier, when it can be used with safety.

Turkey Amber has been, and is still, used by many as a dryer. I, like many others, used it for years, but, from experience, I found it contained nothing of a particular drying quality, being only a mixture of clay, iron, vitriol, zinc, &c. I found it prevented every thing from settling into which it was introduced for a length of time, and I therefore discontinued it. Its best quality is that of an absorbent.

Asphaltum.

There are so many various qualities and descriptions of asphaltum, that it is very difficult to distinguish the good from the bad. There is asphaltum from China, Egypt, France, Neufchatel, and Naples, and many sorts now made in England.

The best which I have found is a native mineral, or genuine Egyptian; it is black, glossy, and heavy, and, when rubbed upon a hot poker, readily melts. It emits a very strong, disagreeable smell, like that of garlick, or assafœtida. It will neither dissolve in oil, water, nor turpentine. It is, in general, when imported, covered with a coat of dust or clay, and mixed with stones, gravel, &c. This Egyptian asphaltum must be fused, of which read hereafter.

Next in goodness is the Naples, which resembles the other in its external qualities. It is much freer from dirt, will dissolve in oil, but it never yields that intense black to the same quantity of oil as the real Egyptian. There are several varieties of Naples, French, and German, which will all dissolve in oil, and have very little difference in quality, only I have always found the softest and most fluid the best; yet of late there is asphaltum made in England, and particularly in London, which comes very near in quality to the best French, Naples, or German. It is the residiuum left from the burning of rosin, pitch, or linseed oil, which the makers of lamp-black burn for the purpose of condensing. Linseed oil, burnt by itself, produces scarcely any residium, but when joined with rosin, it leaves a very fine asphaltum, not inferior to the best Egyptium; but the asphaltum from pitch is very inferior, as it is coarse, gravelly, and never hardens properly. It has a brown hue or tint. As for the asphaltum made from gas tar, it is unfit either for black japan or Brunswick black, and fit only for inferior purposes.

Having described the apparatus, and most of the necessary ingredients, with their relative qualities, it is now proper to give directions how the various varnishes are made, with their component parts, and the various uses they are intended for, beginning upon a scale which every operator or maker can act upon, as may best suit his own inclinations or circumstances; premising that the before mentioned general instructions and precautions are always to be strictly borne in mind.

How to make Copal Varnishes for fine Paintings, &c.

Fuse eight pounds of the very cleanest pale African gum copal, and, when completely run fluid, pour in two gallons of hot oil, old measure; let it boil until it will string very strong; and in about fifteen minutes, or while it is yet very hot, pour in three gallons of turpentine, old measure, and got from the top of a cistern. Perhaps, during the mixing, a considerable quantity of the turpentine will escape, but the varnish will be so much the brighter, transparent, and fluid, and will work freer, dry quickly, and be very solid and durable when dry. After the varnish has been strained, if it is found too thick, before it is quite cold, heat as much turpentine and mix with it as will bring it to a proper consistence.

Artists' Virgin Copal.

From a select parcel of scraped African gum copal, before it is broke, pick out the very fine transparent pieces, which appear round and pale like drops of crystal; break these very small; dry them in the sun, or by a very gentle fire. Afterwards, when cool, bruise or pound them into a coarse powder; then procure some broken bottles, or flint glass, and boil the same in soft water and soda, then bruise it into coarse powder like the gum; boil it a second time, and strain the water from it, washing it with three or four waters, that it may be perfectly clean and free from grease or any impurity; dry it before the fire, or upon a plate set in an oven. When it is thoroughly dry, mix two pounds of it with three pounds of the powdered copal; after mixing them well, put them into the gum pot and fuse the gum; keep stirring all the time; the glass will prevent the gum from adhering together, so that a very moderate fire will cause the gum to fuse. When it appears sufficiently run, have ready three quarts of clarified oil, very hot, to pour in. Afterwards let it boil until it strings freely between the fingers; begin and mix it rather hotter than if it were body varnish, for as there is but a small quantity, it will be sooner cold; pour in five quarts of old turpentine, strain it immediately, and pour it into an open jar, or large glass bottle; expose it to the air and light, but keep it both from the sun and wet, and from moisture, until it is of a sufficient age for use. This is the finest copal varnish for fine paintings or pictures.

Cabinet Varnish.

Fuse seven pounds of very fine African gum copal, and pour in half a gallon of pale clarified oil; in three or four minutes after, if it feel stringy, take it out of doors, or into another building where there is no fire, and mix with it three gallons of turpentine; afterwards strain it, and put it aside for use. This, if properly boiled, will dry in ten minutes; but if too strongly boiled, will not mix at all with the turpentine; and *sometimes*, when boiled with the turpentine, will mix, and yet refuse to amalgamate with any other varnish less boiled than itself; therefore it requires a nicety which is only to be learned from practice. This varnish is chiefly intended for the use of japanners, cabinet painters, coach painters, &c.

Best Body Copal Varnish for Coach Makers, &c.

This is intended for the body parts of coaches and other similar vehicles intended for polishing.

Fuse eight pounds of fine African gum copal; add two gallons of clarified oil (old measure;) boil it very slowly for four or five hours, until quite stringy; mix off with three gallons and a half of turpentine; strain off, and pour it into a cistern.

Observe, these varnishes, by being made in the gum pot, and entirely without driers, are on that account much paler than when each run is poured into the boiling pot, and afterwards boiled off. Varnish made entirely from African copal possesses more fluidity, pliability, and softness, than varnishes made with, or entirely from, gum anime; it also possesses a property of keeping its colour, or rather becoming bleached or paler after it is applied; whereas, varnishes made from gum anime always become darker after being applied. Genuine copal varnishes, from their pliability and softness, are rather slow in drying, and retain for months so much softness that they will not polish well until they give out a moisture and become hard; then they wear well, will never crack, and always retain their polish. As they are too slow in drying, coach makers, painters, and varnish makers, to remedy that defect, have introduced to two pots of the preceding varnish, one made as follows—

8 lbs. of fine pale gum anime,
2 gallons of clarified oil,
3½ gallons of turpentine,
} to be boiled four hours.

This, after being strained, is put hot into the two former pots, and well mixed together; its effect is to cause the whole to dry quicker and firmer, and enable it to take the polish much sooner.

Some varnish makers, contrary to their own judgment, introduce into each small pot of varnish from half to one pound of either sugar of lead, or white copperas, and sometimes only half of each; but no varnish made with dryers will be so brilliant, colourless, pliable, or wear so long, as that made without it. Every description of varnish which has lead for driers will always be the harder for them, and when worn for a time, if minutely looked into, it will be found that the air has separated the particles of lead, which will be found upon the polished surface of the varnish, like an almost imperceptible white dust, exactly in proportion to the quantity of lead introduced into the varnish in making it.

Common Body Varnish, for the same purposes as the first.

8 lbs. of the best African copal,
3 gallons of clarified oil,
3½ gallons of turpentine,
} boiled four hours, or until stringy,

mixed, and strained, will produce about five gallons and a half.

8 lbs. of the best gum anime,
2 gallons of clarified oil,
3½ gallons of turpentine,
} boiled as usual,

mixed, and strained hot, and put into the former pot of African gum

varnish. Put two pots of this anime varnish to one of copal; it will dry quicker and harder than the best body copal, and will polish very soon, but not wear either so long or so well.

Quick-drying Body Copal Varnish for Coaches, &c.

8 lbs. of the best African copal,
2 gallons of clarified oil,
¼ lb. of dried sugar of lead,
3½ gallons of turpentine,
} boiled until stringy, and mixed and strained.

8 lbs. of fine gum anime,
2 gallons of clarified oil,
¼ lb. of white copperas,
3½ gallons of turpentine,
} boiled as before,

to be mixed and strained, while hot, into the other pot. These two pots mixed together, will dry in six hours in winter, and in four in summer: it is very useful for varnishing old work on dark colours, &c.

Best Pale Carriage Varnish.

8 lbs. 2nd sorted African copal,
2½ gallons of clarified oil,
} boiled till very stringy.

¼ lb. of dried copperas,
¼ lb. of litharge,
5½ gallons of turpentine,
} strained, &c.

8 lbs. of 2nd sorted gum anime,
2⅝ gallons of clarified oil,
¼ lb. of dried sugar of lead
¼ lb. of litharge,
5½ gallons of turpentine,
} mix this to the first while hot.

This varnish will dry hard, if well boiled, in four hours in summer, and in six in winter. As its name denotes, this is intended for the varnishing of the wheels, springs, and carriage parts of coaches, chaises, &c.; also, it is that description of varnish which is generally sold to and used by house painters, decorators, &c., as, from its drying quality, and strong gloss, it suits their general purposes well.

Second Carriage Varnish.

8 lbs. of 2nd sorted gum anime,
2¾ gallons of fine clarified oil,
5¼ gallons of turpentine,
¼ lb. of litharge,
¼ lb. of dried sugar of lead,
¼ lb. of dried copperas,
} boiled and mixed as before.

When three runs are poured into the boiling pot, and the regular proportion of driers put in, and well boiled, this varnish will dry hard and firm in four hours in winter, and in two in summer: it is principally intended for varnishing dark carriage work, or black japan, and is also used by house painters for dark work.

Wainscot Varnish.

8 lbs. of 2nd sorted gum anime,
3 gallons of clarified oil,
¼ lb. of litharge,
¼ lb. of dried copperas,
¼ lb. of dried sugar of lead,
5½ gallons of turpentine,

} to be all well boiled until it strings very strong, and then mixed and strained.

N.B. When large quantities are required, it will always be found best to boil off the three runs in the boiling pot. This varnish is principally intended for house painters, grainers, builders, and japanners; it will dry in two hours in summer, and in four in winter.

Mahogany varnish is either made with the same proportions, with a little darker gum; otherwise it is wainscot varnish, with a small portion of gold size.

[TO BE CONTINUED.]

Heaton's Improved Metallic Piston.

In Barton's piston, the three springs which force out the wedges reach against the piston-rod, and are quite independent of each other. In this piston, as constructed by the Messrs. Heaton, a more perfect arrangement exists, which will be made intelligible by the following sketch:—

a a a are the three metal segments; *b b b* are the protruding wedges acted upon by three spiral springs, which react separately and simultaneously against a steel ring, *c*, which surrounds the piston-rod at same little distance. The advantage of this arrangement consists in the uniform distribution of pressure throughout the apparatus.

In the event of one spring being much stronger than another, in Barton's mode of construction, one wedge is pushed forward with more force than the others, and unequal wearing is the consequence; in Heaton's piston, on the contrary, any excess of strength in one spring is met by the yielding of the others,—the most perfect self-adjustment taking place.

The ring *c* is itself a spring to a certain extent, aiding and assisting the action of the others; and although it may not always be found in the centre of the piston, yet will it invariably be found in the true *centre of the combined forces*, producing the most perfect equilibrium in all the parts, and thus affording a steam-tight piston, with a minimum quantity of pressure, and, consequently, of friction also.

[*Mech. Mag.*

CELESTIAL PHENOMENA, FOR OCTOBER, 1834.

Calculated by S. C. Walker.

Day.	H'r.	Min.				
14	15	7	Im. (249) Piscium	,6,	N132°	V150°
14	16	8	Em.		315°	355°
17	17	44	N App. ☽ and ξ Ceti, ,5,	☽ North	4′.7	
21	9	36	Im. 103 Tauri	,7,	95°	148°
21	10	39	Em.		305°	359°
22	13	37	Im. 8 Geminorum	,7,	20°	71°
22	13	51	Em.		362°	308°
23	8	48	Im. 42 e′ Geminorum	,6,	128°	186°
23	9	32	Em.		246°	288°
23	13	25	Im. 48 *m* Geminorum	,6,	45°	101°
23	14	10	Em.		329°	336°

Meteorological Observations for July, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches.	Inches.			Inches.	
⊗	1	60°	83°	29.95	30.00	W.	Moderate.	0.45	Clear—rain in night.
	2	70	88	.85	.35	W.	Breeze.		Showers—sultry—lightning.
	3	72	82	.70	.77	W.	do.		Clear—lightly cloudy.
	4	82	84	.55	29.30	E.	Calm.		Cloudy day.
	5	71	82	.30	.30	W.	do.		Cloudy—flying clouds.
	6	72	92	.30	.30	W.	do.		Cloudy—fog—clear.
	7	72	90	.30	.30	W.	do.		Lightly cloudy—clear.
	8	74	94	.30	.30	W.	do.		Clear—flying clouds.
	9	76	95	.30	.30	W.	Breeze.		Foggy—clear.
	10	76	87	.25	.25	Variable.		0.05	Cloudy—showery.
	11	66	80	.30	.35	NW.	do.		Cloudy—clear.
	12	62	78	.30	30.00	E.	do.		Cloudy day.
☾	13	69	70	30.05	.05	E.	do.	0.07	Cloudy—drizzle.
	14	68	88	.10	.10	W.	do.		Clear—flying clouds.
	15	72	91	.00	.00	W.	do.		Clear do.
	16	70	89	29.95	29.95	W.	do.	0.01	Cloudy—flying clouds—shower.
	17	74	90	.90	.90	W.	do.	0.05	Clear—rain.
	18	64	74	.95	30.10	NE.	do.		Cloudy—flying clouds.
	19	59	76	.75	.75	E.	do.		Cloudy—flying clouds.
	20	64	79	.70	.70	E.	do.		Lightly cloudy—flying clouds.
⊕	21	66	83	.65	.60	W.	do.		Clear day.
	22	70	89	29.85	29.87	W.	do.		Clear day.
	23	70	89	.90	.90	NE.	do.		Cloudy—clear.
	24	72	93	.85	.85	W.	do.		Clear—sultry—gale.
	25	72	92	.80	.80	W.	do.		Clear day.
	26	74	94	.80	.80	SW.	Calm.		Clear day.
	27	76	94	.80	.85	W.	do.		Clear day.
☽	28	72	90	.75	.80	W.	Breeze.		Rain, thunder & lightning—flying clouds.
	29	68	75	.95	.95	W.	do.		Clear day.
	30	69	78	.90	.90	W.	do.	0.50	Rain—cloudy.
	31	64	77	.85	.80	SE.	do.		
	Mean	69.51	85.35	29.88	29.94			3.36	

Thermometer.		Barometer.
Maximum height during the month,	95. on 9th.	30.75 on 3d & 19th.
Minimum do.	59. on 19th.	29.25 on 4th.
Mean do.	77.43	29.91